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The AUTOMOBILE

Tax Gasoline—Tax Coal, Oats

Gasoline Tax To Yield $12,000,000 Annually—Horse Tax Would Yield $365,000,000

If One Fuel Is Taxed All Should Be

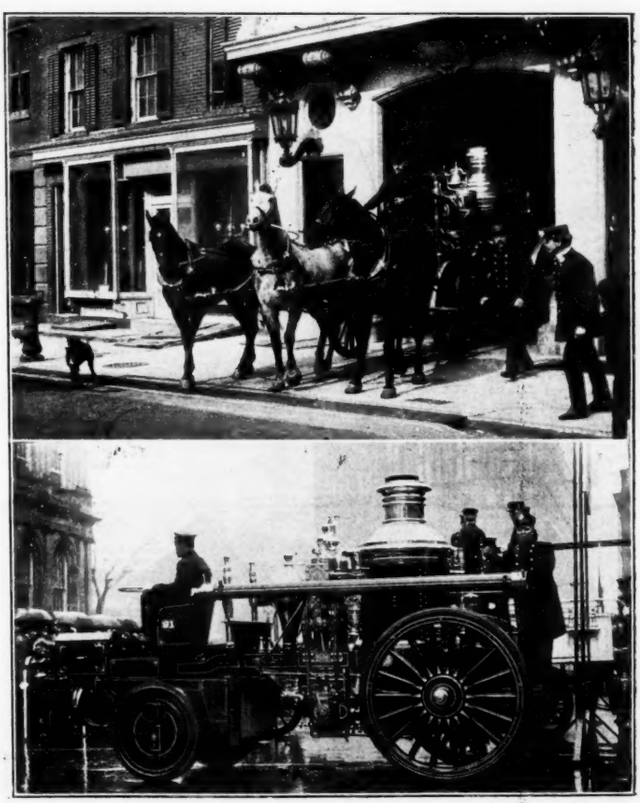
By J. Edward Schipper

Horse carriage not taxed; taxicab may pay

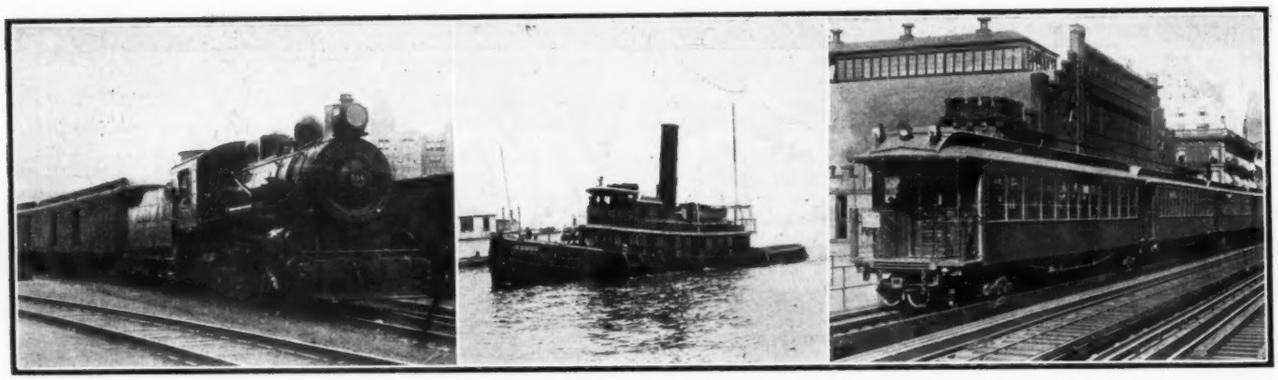
OUR Government wants to raise $12,000,000 through a tax of 2 cents per gallon on gasoline. If the food for horses were taxed on the same proportion it would amount to $1,000,000 per day or $365,000,000 per year.

Statistical reports from the Department of Agriculture give the ratio of horses to peopie in the United States as .21 to 1. There are now more than 90,000,000 people in this country and hence more than 18,000,000 horses. Regarding food as the fuel of the horse, each animal uses 65 cents worth a day, or approximately the equivalent in money value of 4 gallons of gasoline. At this rate if an equal tax were made each horse would be taxed 8 cents a day and the yield to the Government would be more than $1,000,000 per day, or $365,000,000 per year.

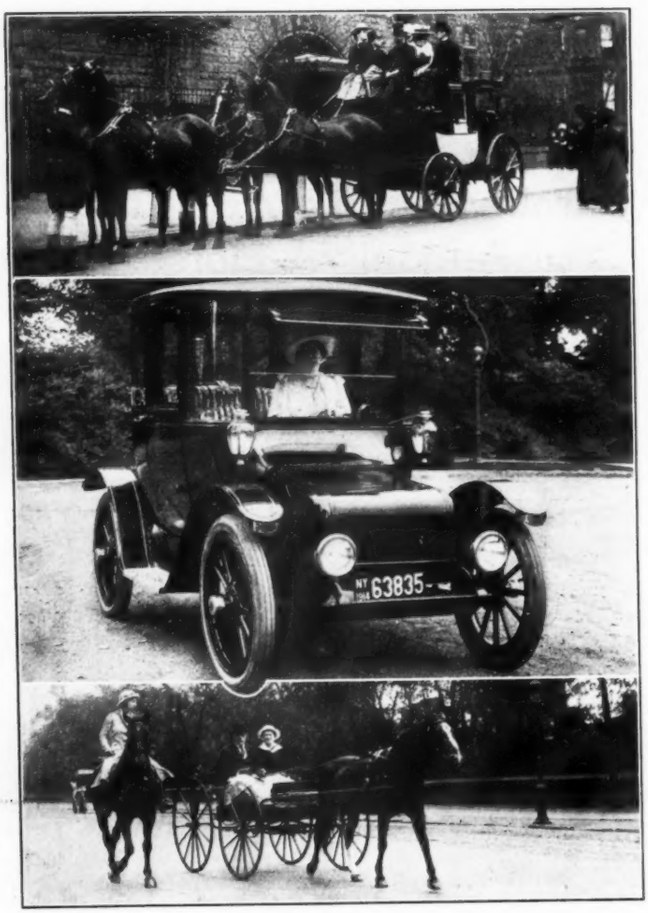
Because the automobile is economical and does not use the same amount of food or fuel as the horse a tax rate is put upon it that would be out of all proportion to that which would be applied to horses even were they taxed. The Government would not expect a yield of $1,000,000 a day or $365,000,000 a year from horses. But if an automobile used the same amount of fuel as a horse, that is the rate at which the proposed tax would work out. Regarded in this light it is nothing more than a tax on economy.



While the horse fire engine is slower, it is not taxed; the motor fire apparatus might pay a duty



Three classes of vehicles that would not suffer under the proposed legislation, locomotive, towing vessel and elevated train



Luxurious methods of travel that would pass untaxed

The proposed tax on gasoline will double the cost of motoring so far as taxation is concerned. To explain: In the State of New York a man owning a 30-horsepower touring car pays an annual registration fee of $10. If he travels 7,500 miles and averages 15 miles to the gallon he will use 500 gallons of gasoline. At the proposed tax of 2 cents per gallon he will have handed the Government another ten dollar bill at the end of the touring season. His annual fees for the privilege of using his car are doubled, are $20 instead of $10.

The operator of a 3-ton truck who drives 10,000 miles in a year, will use approximately 2,000 gallons of gasoline. At 2 cents per gallon the tax will be $40 a year in addition to his $5 registration fee.

There are 1,500,000 motor vehicles now in use in the United States. The average vehicle travels 4,000 miles in a season. To be conservative it will travel 10 miles per gallon. In other words, it will use 400 gallons in a season, paying a tax according to the proposed rate of $8 per year.

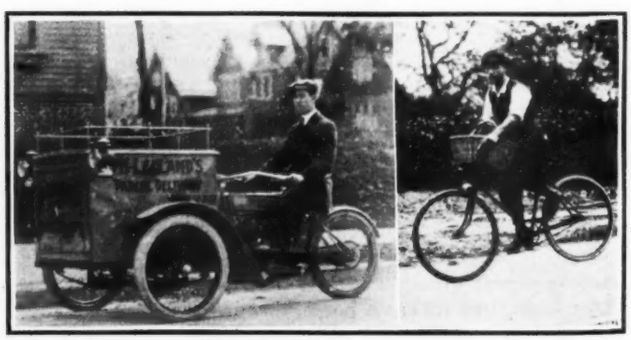
NOT LESS THAN $12,000,000 WILL FIND ITS WAY FROM THE POCKET OF THE MOTOR-USING PUBLIC INTO THE HANDS OF THE STATE IN A SINGLE YEAR.

The American citizen is patriotic and is willing to stand behind the Government and meet the demands of taxation, when that taxation is just, without a murmur. The $12,000,000 which is drawn from the automobile user during the year would doubtless be paid without protest were it not for the seeming unfairness of a tax which recognizes one class and ignores another. The citizen who owns a fleet of motor-moving vans has to compete with another who owns a fleet of horse-drawn vehicles. The Government proposes to tax the progressive man who has displaced his horses by the more modern method and not to tax the one who employs the less efficient vehicle.

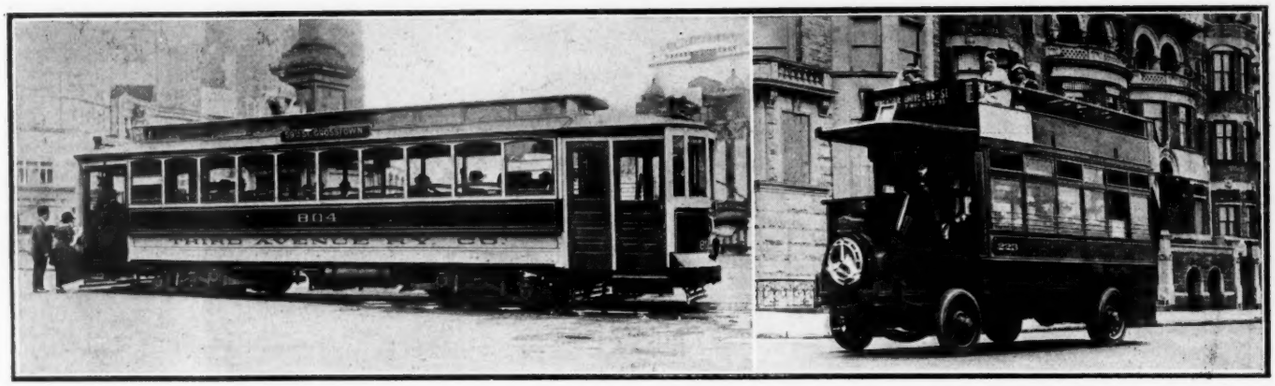
It should not be the purpose of those in authority to place a tax upon the factors of efficiency in any man's business.

A lady stepping from her luxurious residence into her waiting electric is carried to the door of her jeweler, purchases a pair of ornamental and expensive earrrings and returns to

The gasoline van taxed, the electric untaxed



Delivery by motor vehicle would be taxed; by bicycle, not



The trolley does not pay a tax on its fuel, while the motor bus would if the new law went into effect

her home after a trip in which there has been no industrial good gained for the community, insofar as the method of propulsion of her vehicle is concerned. That is, had she taken a passenger bus the same effect would have been accomplished. Her trip has been an untaxed luxury. On the other hand a family moving its household effects from the city to the farm and employing the gasoline truck has according to the reasoning to be inferred from the proposed tax committed an act which should net an income to the Government. One type of vehicle is taxed, the other is not.

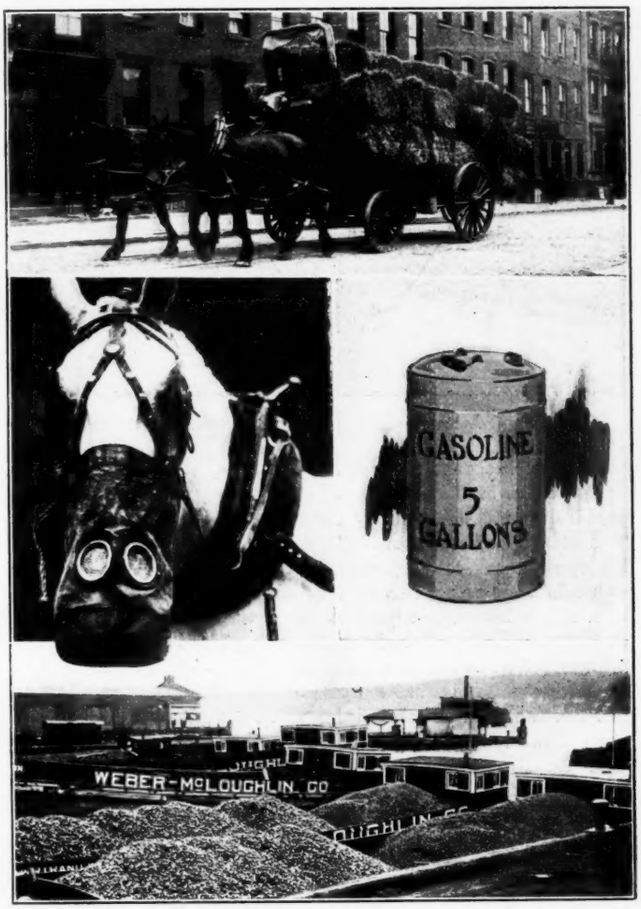
If the grocer delivers our groceries by gasoline truck he is taxed. If he employs a bicycle, an electric, or sends a boy on foot, he is not.

This analogy can be carried beyond the motor car industry. The fisherman, on the banks of Newfoundland earning at great risk to himself and with small returns for his efforts an income from the sea, makes use of the motor dory. He uses gasoline for fuel and therefore should be taxed according to those who propose the suggested legislation. On the other hand the millionaire, who cruises about the sea in his palatial steam-yacht not seeking the treasurer of the ocean for profit or as a means of eking out his existence, is not taxed.

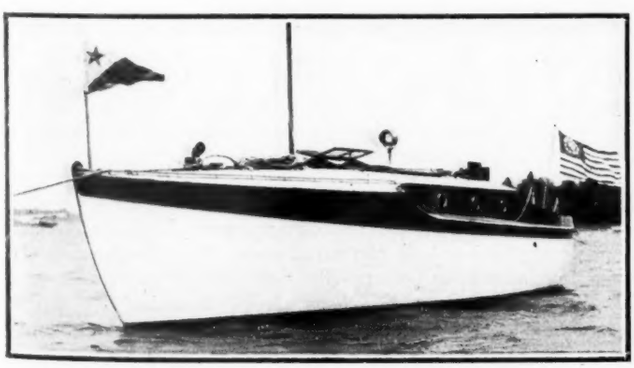
Tax One, Tax All

IF WE TAX GASOLINE, TAX COAL, WOOD, COKE, CRUDE OIL OR PRODUCER GAS.

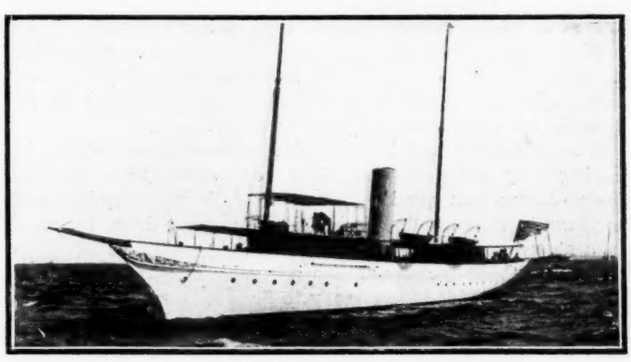
There can be no explanation why these fuels are not taxed, unless it is they are not used to propel automobiles. When the automobile originated it was the sport of the wealthy. The idea was engendered in the minds of those who witnessed the industry in its early stages that the owner of a motor car was of necessity a person of wealth. That idea is the seed which has created the growth of the idea which has now borne fruit in the proposal of a tax on the prime necessity of the automobile user. The horse is to the horse-drawn vehicle what the motor is to the motor-driven vehicle. Potentially, both are engines. Both need fuel. What the gasoline is to the motor, oats and hay are to the horse. Yet our government



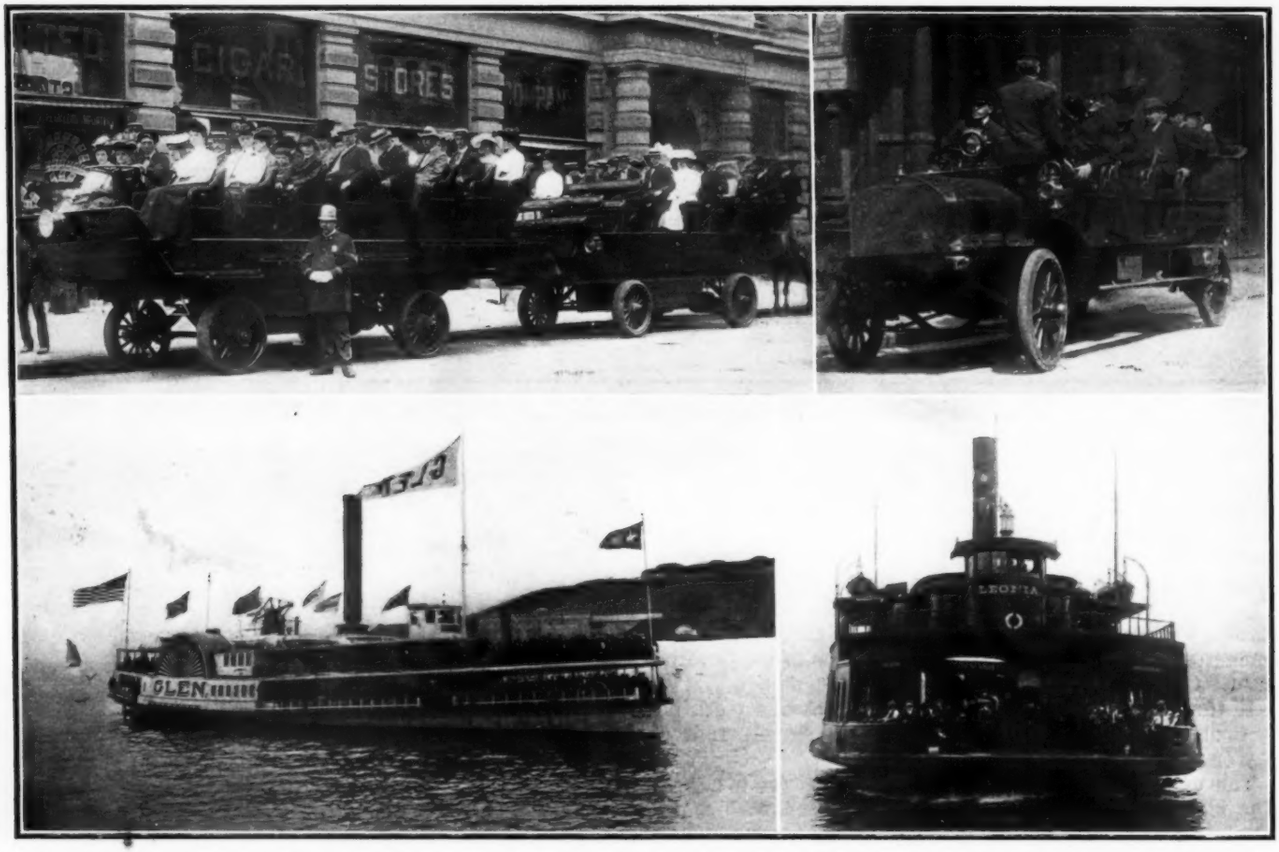
Hay, oats and coal are fuels that would not have to pay. A 5-gallon can of gasoline would net the government 10 cents



Gasoline launch would pay a duty of 2 cents per gallon



Steam yachts use coal and would not be taxed



Electric sight-seeing buses would not be taxed while gasoline ones would. Excursion boats and ferryboats would be on the free list

would tax the gasoline but not the oats, hay or other fuels.

There can be no intention of an attempt to drive the transportation plan of industry back to the wasteful quadruped. The motor car has proved its service to the governments of Europe and our country does not fail to recognize its immense value in times of peace as well as war. Gasoline has risen at a single bound to a position as a war-time necessity equal in importance to railroads and horses. Yet it is the only war necessity that is taxed. The question can be justifiedly asked, if we can tax one munition of war why not tax others? Why not tax the food for the mules when we are taxing the food for the motors? Both do the same work.

If the Government desires to raise $12,000,000 per year on fuels and then spread this tax over all the industrial fuels that are used, it would be found that the motorist would bear but a small percentage of the total. In our large cities, where millions are carried daily from their homes to their daily tasks, electricity plays the most important part in the transportation total. If it seems fair to tax the moving of household goods when they are moved by gasoline, would it not be also fair to tax the same people when they are making use of another fuel for the same purpose?

If it seems reasonable to tax a business man who comes downtown in a motor bus a small amount for each ride, would it not also be reasonable to tax the same individual for his rides in an electric-driven subway train?

The comparison can be brought even more close to home by asking why the man who rides down town in a gasoline motor-driven bus should be taxed while his neighbor who happens to take an electric bus or who comes down the river in a steam yacht, is not.

The 1,500,000 motor vehicles are vehicles of necessity and not luxuries. If it is necessary to have a 20-hour train from Chicago to New York, if it is necessary to have express trains on our subways, if it is necessary to have express service on our elevated railroads; then, it is equally necessary to have our gasoline cars which will carry the business man from his suburban home to his office with the greatest comfort and the least expenditure of time.

The business man considers it an economic investment to travel with the comforts of the limited train and save 4 or 5 hours besides. It is an equally economic investment for the business man to use his motor vehicle every day.

If it is necessary to have our fast freights to carry merchandise it is equally necessary to have our motor trucks that can deliver similar merchandise from the hub of our metropolis to the fringe of suburbs within a zone of 50 or 75 miles.

IN THESE FIELDS THE GASOLINE TRUCK IS AS GREAT A NECESSITY AS THE FREIGHT LOCOMOTIVE.

Why tax gasoline and not coal, why tax a motor vehicle and not a railroad train?

We insist on the fastest train for mail service. Our trans-Atlantic steamers are paid to make high speeds while serving the Post Office. Between offices in our great cities motor trucks are allowed to travel with special traffic privileges to make the best possible time in carrying on the vast mail business of industry. Why do we tax such a vehicle?

The intensified business method of today demands the maximum of out-door life. The automobile has been one of the greatest factors in supplying his necessity. Why tax an instrument of health? But, if we must tax it, then tax baseball, horse racing, golf, boating, tennis, etc.

It is a tax on the essence of progress. It is a tax on progressiveness because it is used only by the most progressive in business. It is a tax on economy because in commercial lines economy has been the great reason for its adoption. It is a double taxation because the motor vehicle now has to pay a state tax and very often it is a triple taxation in that the state collects money, sometimes the city and now the government would also take its turn in gathering an added revenue from this necessity.

Europe Orders 1,000 More Trucks

Both Belligerents and Non-Combatant Nations Send Emissaries To Buy American Commercial Vehicles—Quick Delivery Wanted—Order of 1,000 Trucks 2 Weeks Ago Officially Confirmed

NEW YORK CITY, Sept. 30—That European countries are deeply concerned in purchasing motor trucks from America has been again demonstrated this week, when an emissary of a European country arrived in America with direct orders from his government to purchase 1,000 motor trucks for the earliest possible delivery. These are to be 2-, 3- and 5-ton types. This fact coupled with similar requirements announced 2 weeks ago of European countries needing 1,000 trucks gives direct evidence of the stimulating influences on American truck business of the present war. In addition to these two large requirements, there have been many smaller shipments within the last month aggregating 200 trucks, so that the grand total of American trucks needed today by European countries, several of which are not belligerents, is 2,200.

Demand Is for 2, 3 and 5 Ton Trucks

SOUTH BETHLEHEM, PA., Sept. 30—The fact that European countries had their emissaries in America to purchase 1,000 motor trucks, which was published in THE AUTOMOBILE 2 weeks ago, has now been officially confirmed by the Bethlehem Iron & Steel Co., South Bethlehem, Pa., which has become the purchasing department of these foreign governments not only for the motor trucks, trailers and wagons, but also for such army supplies as horseshoes, army blankets, horse blankets, medical supplies, etc.

Buyers Are Increasingly Active

These emissaries of foreign governments, after making their headquarters in New York, invaded South Bethlehem, where the normal purchasing department of the steel company was set aside, and the entire executive department, including the board of directors, became a purchasing department of the whole for these various products.

As stated 2 weeks ago, the demand is practically for 2-, 3- and 5-tontrucks, many with trailer arrangements. The most popular military truck ranges from 2- to 3.5-ton capacity, as this is closely allied with the subsidized European truck.

Quick delivery is wanted on the majority of the merchandise ordered, due to the coming winter and the general military operations in Europe. It is now known that 150 motor trucks have been shipped from ports on the North American Continent during the past 10 days, and buyers from other foreign governments have arrived within the past week.

C. of C. Protests 2-Cent Gasoline Tax

NEW YORK CITY, Sept. 30—The National Automobile Chamber of Commerce has sent out letters of protest to members of the United States Senate against the tax of 2 cents a gallon on gasoline, naphtha and other similar products obtained from crude, partially refined, or residuum oils and suitable for motor power, as provided in the war revenue bill that was passed in the House of Representatives.

The National Automobile Chamber of Commerce points out that this is an excessive tax of 15 to 20 per cent. on a necessity and not a luxury; that the great majority of automobiles today are bought and used by farmers and others of moderate means, and that the tax will fall upon the consumer and not the producer of gasoline.

T. R. Lippard, president of the Stewart Motor Corp., Buffalo, N. Y., states, "We are strongly opposed to the gasoline tax because it puts the burden on such a small percentage of the people. The taxation should be borne by the majority instead of the few. Less than 2 per cent. of the people own automobiles and they are big users of gasoline automobiles. They are at present heavily taxed by the states or their own municipalities."

James L. Geddes, president of the Kelly Springfield Motor Truck Co., Springfield, O., states, "I believe the proposed tax on gasoline unwarranted as gasoline cannot possibly be considered a luxury. It is just as much a necessity as coal or any other fuel."

Car Owners Protest Proposed Taxation

WASHINGTON, D. C., Sept. 30—*Special Telegram*—The Senate finance committee is holding daily sessions on the war emergency tax bill and Chairman Simmons hopes to report the bill to the Senate before the week end.

Now that the committee is talking of substituting for the gasoline tax a tax on automobiles, to be measured by horsepower, owners of motor cars are beginning to be heard from. Senators and House members are receiving letters warning them that the automobile is no longer a luxury, but a necessity.

Members are being reminded in these protests that to tax automobiles would mean taxing trucks and vehicles used by merchants and business houses, and that this would be a tax on business in another guise.

A hot blast on the automobile tax came today from a Western preacher, Rev. V. M. Elston, Griswold, Ia. He denounced the proposed tax on gasoline and also the proposed automobile tax. He said gasoline was used by farmers and others for power purposes and its use was by no means confined to automobiles. As for the automobile tax, he informed Senator Kenyon that automobiles had become a necessity, whereas a lot of benighted folk seemed to be laboring under the idea it was still a luxury.

New Peerless Four for $2,000—Six $2,250

CLEVELAND, O., Sept. 29—Announcement has just been made by the Peerless Motor Car Co., of a lighter line of four- and six-cylinder cars which will supplement the large 48-horsepower sixes the company has been building for several years. The new four and six are styled "all purpose cars" as they are intended to perform equally well in touring work as for city driving. The four is offered at $2,000 and the six at $2,250.

The Peerless company places special emphasis upon the fact that these new cars are of European design, having small bore, high speed engines, that of the four being 3 3-4 by 5 and of the six 3 1-2 by 5. The wheelbases are 113 and 121 inches, respectively.

The bodies are streamline and very handsome. The front seats are of the individual type, making it possible to pass between them to the rear compartment.

Spiral bevel gears are used in the rear axles of these Peerless models as well as in the larger cars of the line. Some of the other features are left drive and center control, gear-set of three-speed type in unit with motor. Gray & Davis cranking and lighting in connection with a 60-ampere-hour storage battery, multiple-disk clutch, vacuum gasoline feed from rear tank and the regular form of Peerless platform rear springing.

The equipment includes one man top, rain vision windshield, demountable rims with one extra, Stewart speedometer, tire pump, electric horn, and tools.

Complete description of these new Peerless models will appear in an early issue.

Packard Shipments Increase 75 Per Cent.

NEW YORK CITY, Sept. 30—The Packard Motor Car Co., Detroit, Mich., has increased its shipments for the last 2 months 75 per cent. over the corresponding time last year.

Comparing the Six With the Eight

Six Is Simpler and Lighter—Two Carbureters Almost a Necessity on Eight—Little Difference in Running Between the Six and Eight

By S. I. Fekete
Hudson Motor Car Co.

DETROIT MICH.—Editor THE AUTOMOBILE:—The recent advent of the eight-cylinder motor in America strongly recalls the situation of a few years ago when the six-cylinder motor was at a similar stage of its development. Should two more cylinders added to a six produce as great an improvement as did the addition of two to the four-cylinder motor a few years ago, then there would be grounds for believing that American manufacturers would be called upon in the future to meet a popular demand for an eight-cylinder motor.

The ascendency of the six-cylinder motor over the four was not established until after several years of educational work to familiarize the buying public with such features as, the effect of overlapping power strokes, smoothness, silence, flexibility and perfect balance.

Perfect Balance in Six

THE PUBLIC HAS THUS COME TO KNOW THAT NOT ONLY ARE THE VIBRATIONS DUE TO EXPLOSION PRESSURE, AND ACTION OF RECIPROCATING PARTS EQUALLY WELL BALANCED IN THE FOUR AND SIX, BUT ALSO THAT THE OCTAVE OR SYNCHRONIC VIBRATIONS OF THE FOUR ARE PERFECTLY BALANCED IN THE SIX.

The assimilation of these engineering principles would not have been alone sufficient to give the six its present dominance were it not for the fact that the six has in actual use adequately fulfilled claims which theory advanced in its favor.

The pioneer designers of six-cylinder motors based their designs upon extensive theoretical research in which they investigated by graphical means the advantages to be obtained by various cylinder numbers, groupings and firing orders.

The six-cylinder motors accomplished all that their engineers anticipated and eventually received the almost unanimous endorsement of that most skeptical and discriminating of critics—the buying public.

ANY MULTIPLE-CYLINDER MOTOR WHETHER OF TWO, FOUR, SIX OR EIGHT CYLINDERS IS THEREFORE NOT AN INVENTION BUT A DEVELOPMENT BASED UPON COMPARISON OF THE RELATIVE ADVANTAGES OF GROUPINGS OF CYLINDERS TO REMEDY CERTAIN DEFECTS, AND TO GAIN CERTAIN APPRECIABLE ADVANTAGES OVER A MOTOR OF FEWER CYLINDERS.

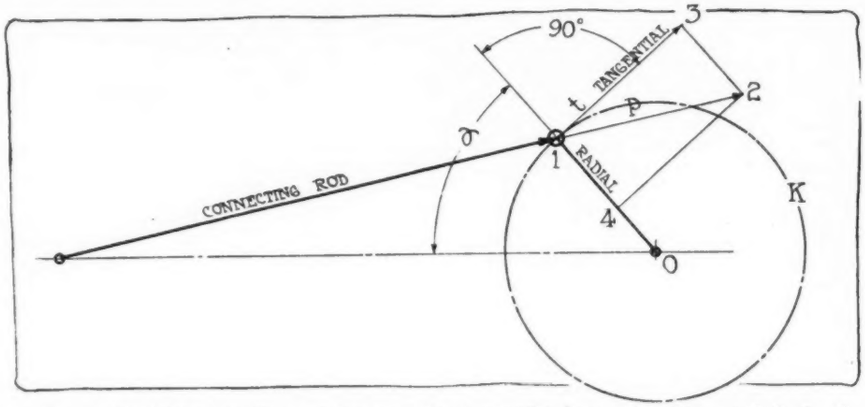


Fig. 1—To determine the magnitude of the tangential force when the crankpin is at any given angle from the center line of the cylinder. Line 1-3 is the tangential component and 1-4 the radial. It is first necessary to understand this tangential portion of the resultant force before considering what is to follow

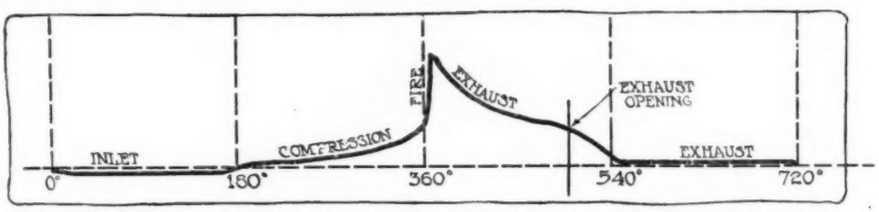


Fig. 2—The working forces acting in one cylinder for a complete cycle plotted on the 720 degrees of a cycle as a base and considering the pressures as ordinates. The pressure thus plotted may be taken from an indicator diagram. The first quarter, or 180 degrees, of the cycle is negative work on account of suction

Six vs. Eight

So far as the overlapping power stroke in six-cylinder and eight-cylinder motors is concerned, it is true that the six does not get its second cylinder into action until later than the eight, but this in reality is fortunate because the second cylinder of the six comes into action at a point where the negative forces are at a maximum, whereas in the eight-cylinder motor the overlap comes in a place where the negative forces are at a minimum. This fact will be proven later in this article by means of diagrams.

Different from Aviation

The imitative tendency of human nature might lead the buying public to the conclusion that because multi-cylinder motors have been used to a large extent in aerial navigation they are equally desirable for automobile use. This impression is somewhat fallacious because the requirements of terrestrial and aerial transportation are essentially different. In aerial work gasoline economy is unessential and the important factors are safety and high power ranging from 80 to 200 horsepower. To both these factors the multi-cylinder motor is best adapted; to high power because by dividing a large piston displacement among several cylinders lower bearing pressure and stresses are obtained; to safety because with a motor of ten or twelve cylinders the misfiring of three or four cylinders does not imperil the life of the aviator, while with a motor of four cylinders his only safety would lie in his ability to plane back to earth.

In the case of an automobile motor these two requirements are entirely absent, so that imitation of aerial methods provides hardly sufficient reasons for adoption.

The De Dion eight-cylinder motor is much heavier per unit of piston displace-

ment than a six. When multiplicity of parts, intricate connecting-rod and magneto construction and complications in the lubricating and carbureter systems are considered, it would appear that manufacturing costs would be higher.

In this connection it is almost a necessity to use two carbureters to obtain efficient carburetion because of the fact that the manifolding and firing order is such that it is practically impossible to utilize the momentum of inflowing gas column on account of the action of the next cylinder which begins to take in gas when the preceding cylinder has reached only half of its travel.

Fours Are Out of Balance

In the case of a four-cylinder motor the octave vibration is synchronous and is therefore absolutely out of balance.

The six is perfectly balanced as regards octave vibrations.

The octave vibrations of the eight V-type are nearly in perfect balance and are in perfect balance in the eight all-in-line.

By octave vibration is meant vibration due to the non-infinite length of connecting-rod. That is to say when the piston is at half of its travel the connecting-rod is not yet quite 90 degrees on the crank circle from the vertical.

The present state of the art permits making six crankshafts in all respects the equal of eight throw cranks as regards vibration and deflection.

Reason for Diagrams

The surest way of finding out what results that a certain cylinder grouping will give is by a combined graphical representation of the functions of the cylinders not only as individuals, but also when acting simultaneously. The illustrations in this article are used for this purpose.

IF THE DIAGRAMS THUS PRODUCED SHOW HARMONY AND BALANCE BETWEEN POSITIVE AND NEGATIVE WORK, ONE CAN DERIVE FROM THEM INFORMATION WHICH WILL GUIDE IN DESIGNING A MOTOR TO GIVE DESIRED RESULTS.

The Vibration Pole

Inasmuch as the amount of vibration is the essential factor in comparing motor types, let us proceed to study this side of the subject.

If a well-balanced motor is running smoothly and we disconnect a spark plug it immediately becomes apparent from the sound that something is irregular.

To graphically duplicate the above conditions we may plot two tangential diagrams, the first representing all cylinders firing and the second representing one cylinder not. The first will represent the normal function of the motor and the second the impaired function. That is, the first diagram will consist of a series of undulations repeated at regular intervals while the second diagram will have similar undulations but at regular intervals one will be lacking and impair the harmony of the diagram.

The tangential diagram might therefore in popular parlance be termed the criterion of the motor, and from it we may derive conclusions as to the running qualities of the motor.

The obviously smoother running qualities of a six over a single-cylinder motor are accurately reflected in the tangential torque diagrams of the two, the curve variations in the six being small as compared to those of the single-cylinder because of the more uniform torque of the six.

Best Motor Defined

A motor which runs with the least injurious action of reciprocating parts and with the most uniform power acting constantly on the crankshaft is the best and smoothest running. A horizontal line is the graphical representation of such an ideal condition and it is approached only by certain types of electric motors. Such a line indicates no fluctuation.

The most complete information for exhaustive study of motor performance is offered by its tangential torque diagram and it clearly represents the working functions of the motor, both of reciprocating and rotating parts, including such items as:

Pressure variation during working stroke due to increase of gas volume.

a.—Acceleration of piston.

b.—Influence of acceleration and deceleration on the inlet, compression, working and exhaust strokes.

c.—Back pressure during exhaust stroke.

d.—Negative pressure in the inlet manifold.

e.—Character of pressures changes between crankpin and connecting-rod.

Not only are the above functions shown for each cylinder, but their simultaneous action in all the cylinders is revealed by this tangential torque diagram. *Therefore, if we have two motors of the same bore, stroke, compression, reciprocating and rotating part weights, the tangential diagram affords a fair and impartial means of comparing their performance.*

Need of Flywheel

Only motors, whose torque throughout each revolution is uniform, are capable of rotating with uniform angular velocity. Inasmuch as no existing gas motors possess constant magnitude of torque it is necessary to add a flywheel to approximate anywhere near uniform

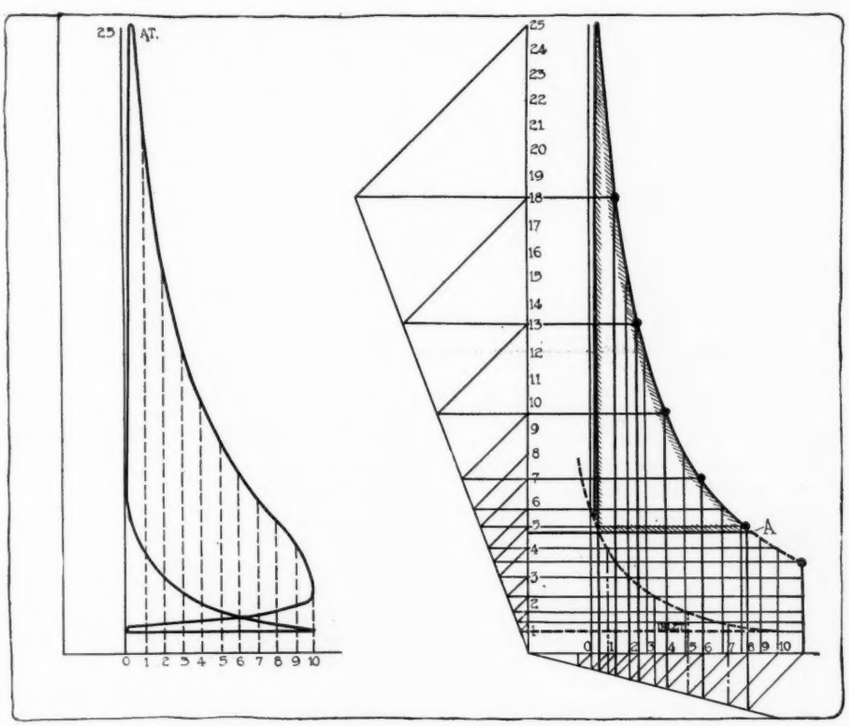


Fig. 3—Left—To take account of the pressure acting in a cylinder an indicator card is used. This shows positive and negative work, the only positive work being that done by the expansion of the gases after ignition. For later plotting purposes the base line has been divided into ten parts

Fig 4—Right—A theoretical work diagram for a single cycle. For purposes of comparing the negative work of different cylinder systems, the ignition pressure is considered to be 25 atmospheres. This merely serves to magnify the negative work and cannot be done except on a comparative basis. The only abnormal feature of the diagram is the exhaust line A; which is straight and at a height of 5 atmospheres. This corresponds to 75 pounds

Fig. 5—Left—Diagram of the inertia forces which act to oppose the motion of the masses; namely, piston, piston pin and upper end of connecting rod. These forces are neutral at middle of stroke and reach their maximum at top or bottom of the stroke. The diagram is plotted on one stroke as a base line

FIG 5

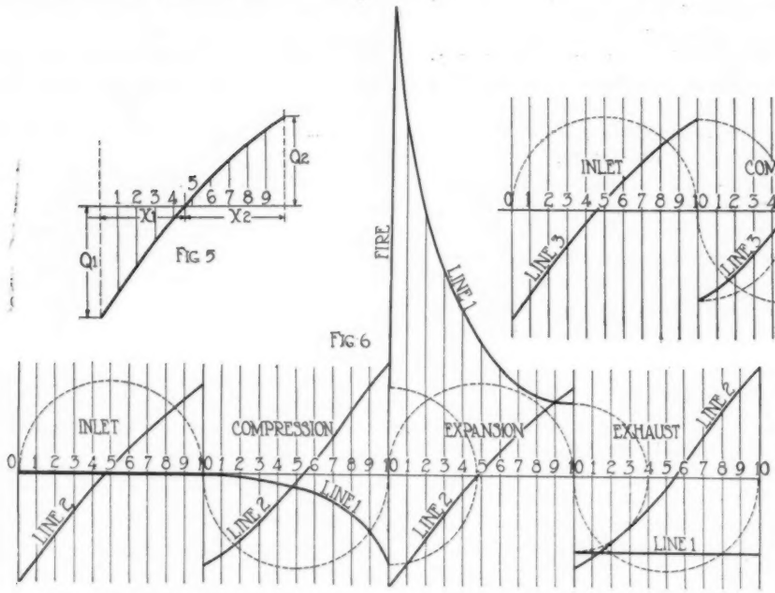


FIG 6

Fig. 6—Combining the inertia force of one cycle with the working forces acting due to the four steps of suction compression expansion and exhaust in a cycle. Line 1 shows the working pressure of Fig. 2 plotted to the same scale as the inertia forces, line 2, which are shown separately in Fig. 5

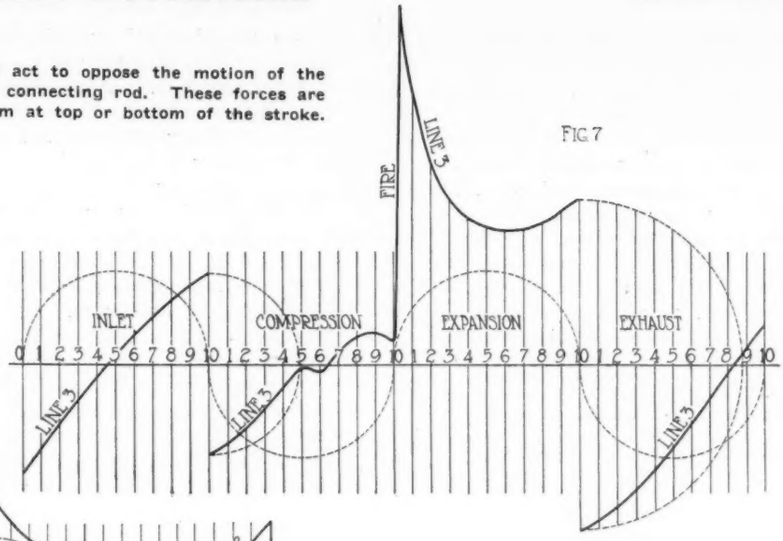


FIG 7

Fig. 7—Right—The algebraic sum of the ordinates of curves 1 and 2 shown in Fig. 6 combined at each vertical line and curve drawn through the resulting points. This curve is line 3 and shows actual pressure on piston, taking into account inertia forces as well as working forces. Positive pressure above and negative below zero line

angular velocity, and while in a multiple-cylinder motor it is impossible to detect with the eye any variation in the angular velocity, this nevertheless exists.

As an illustration of this variation, let us consider the example of a large single-cylinder stationary gas engine, the speed of which is regulated by a hit-and-miss governor. The explosions being considerable distance apart, it is possible from the general sound to detect that the motor speeds up just after an ignition and slows down before the next.

The purpose of the flywheel then is to distribute over the rest of a cycle the energy imparted to it at the time of the explosion stroke and inasmuch as the diameter and weight of any flywheel are necessarily constant, the only possible way in which it can accumulate energy is by increasing its speed. Conversely then any substraction of energy from the flywheel can only be accomplished at the expense of a decrease in speed.

CONSEQUENTLY, WHILE THERE IS NO READY MEANS OF DETECTING IT, A VARIATION IN ANGULAR VELOCITY OF THE FLYWHEEL EXISTS AND THIS IRREGULARITY OF MOTION IS TRANSMITTED TO THE RECIPROCATING PARTS AND CYLINDERS WHOSE REACTIONS TO THESE INTERMITTENT MOTIONS IS ONE CAUSE OF VIBRATION.

Use of Tangential Diagram

A tangential torque diagram, therefore, affords a very logical and clear means of comparing power overlap, and frequency and amplitude of torque changes. It has been used as a means of determining torque variations and for thereby computing flywheel weight to overcome as far as possible these variations. It may be used equally as well to compare torque variations of six and eight-cylinder motors.

Determination of tangential pressures, Fig. 1. The angle which the crankpin makes with the centerline of cylinder when at a given point on its path.

Line 1-3 is the magnitude of tangent force.

This magnitude is, therefore, on the same scale as that chosen to represent the pressure along the connecting-rod.

The working diagram of one cylinder could be represented in a continuous diagram such as Fig. 2.

The magnitude of pressure in the cylinder can be taken from an indicator diagram. Before this diagram can be made to correctly represent all the features we desire we must divide the work represented upon it into two classes, positive and negative.

The positive work is that produced by explosion pressure on the piston.

The negative work is that consumed in the motor itself. The only positive work is the expansion work.

To take account of these two quantities we proceed as follows:

First—Divide the indicator diagram by ten or more equally spaced vertical lines representing crank angles, Fig. 3.

Second—Plot the continuous diagram from an indicator diagram, Fig. 2.

Inertia Forces

Third—Draw a continuous diagram representing the pressure on crankshaft caused by the moving masses such as piston, piston pin and upper end of connecting rod, Fig. 5.

Fourth—Superimpose the continuous indicator diagram, Fig. 2, and the diagram, Fig. 5, representing pressures caused by moving masses, lines 1 and 2, Fig. 6.

Fifth—Take the algebraic sum of the ordinates of these two curves at each vertical line and a curve drawn through these points will give a combined continuous diagram representing actual pressures on piston, positive pressures being plotted above the zero line and negative below, line 3, Fig. 7.

If we now take the pressures represented by the above ordinates at each interval throughout the entire cycle we may, by the method shown in Fig. 1, determine the magnitude of their components acting tangent to the crankpin circle. The magnitude of these tangential increments, represented by t, may be plotted on our previous system of ordinates and the curve drawn through will then give a graphical representation of the tangential forces acting on one crankthrow for the complete cycle, Fig. 8.

For a multiple-cylinder motor the individual curves of tangential forces may

be plotted one upon another in the sequence in which the cylinders fire, and arranged their proper angular distance apart on the developed crank circle. The resultant curve for the given number of cylinders may be plotted by taking the algebraic sum of the ordinates at each interval and passing a curve through them. Fig. 10 is the resultant curve of a four, Fig. 11 of a six and Fig. 13 of an eight so obtained.

This line will correctly represent the fluctuations of power in the given system of cylinders and by correctly interpreting it we shall be able to understand the functional ability of that system.

In order to compare the negative work of the different cylinder systems, Fig. 4 represents a theoretical diagram for a single cycle, the curves being constructed on the theory that they are adiabatic in character. Imagine the ignition pressure to be 25 atmospheres and the compression 5 atmospheres. The only abnormal feature of the diagram is the exhaust line which is straight and at the height of 5 atmospheres. In other words, it is assumed that the piston pushes the gases out against this back pressure. This is, of course, not actually the case, but the artifice was adopted solely for the purpose of exaggerating the negative work. This negative work is a large factor in determining the minimum tangent pressure, and as this minimum point is the one which is essential in comparing four, six or eight, it is desirable to accentuate that point as strongly as possible.

In parallel with this exaggerated diagram a correct diagram has been shown in which it will be seen that the minimum tangential pressure point is somewhat obscured, Fig. 9.

Figure 16 is a chart representing the conditions under which the six-cylinder diagram was constructed, and shows what is taking place in each cylinder at any time.

When the four versus six-cylinder controversy was at its height, illustrations similar to those shown in Figs. 16 and 17 were frequently employed to show the value of overlapping power strokes and we shall in the near future probably see similar pictures representing overlap of eight cylinder power strokes. While in the case of the six-cylinder motor these charts were approximately correct they would, in the case of the eight-cylinder V or all-in-line type motor, have a somewhat fictitious appearance. Such a chart for the latter motor would certainly show a beautiful overlap of power, but the fallacy of this is that in such a chart the negative work has been entirely neglected.

Interpretation of Diagrams

Returning to Figs. 11 and 12, both diagrams show equally enlarged negative

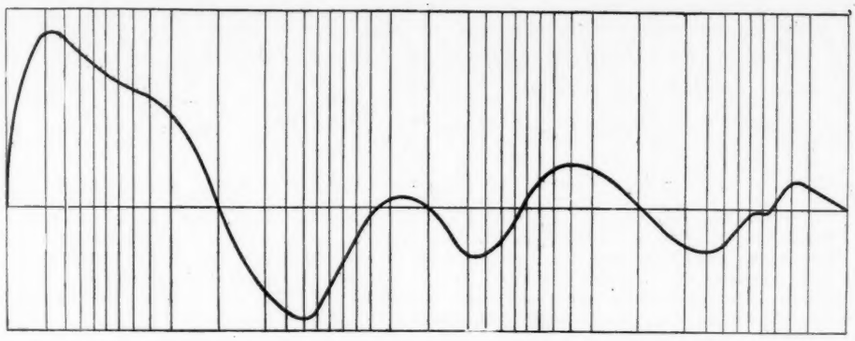


Fig. 8—Taking pressures at each of the ordinates in Fig. 7, at each interval of the cycle and determining the tangential components as in Fig. 1, the magnitude of these is here plotted on the same scale of ordinates to give the curve shown. It is a graphic representation of the tangential forces acting on one crank for a complete cycle. Those above base are positive forces, and below, negative.

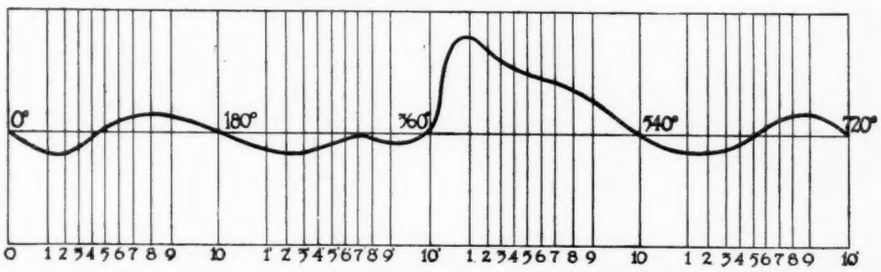


Fig. 9—This diagram has been secured in exactly the same way as Fig. 8, only the negative pressures are correctly drawn. This diagram is shown in order to make clear why the negative pressures are exaggerated. Since the negative work is a larger factor in determining the minimum tangential pressure and as this is essential to a compression of fours, sixes or eights, it must be better accentuated than a normal diagram will do it.

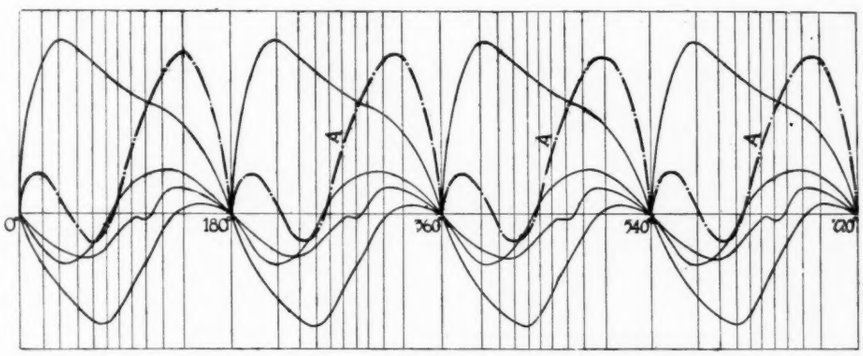


Fig. 10—This curve is the curve resulting from superimposing the tangential diagrams of four cylinders on the one cycle base line. That is, four curves similar to Fig 8, exaggerated negative pressures, are placed on the 720 degrees in order as they act in the cylinders, and then the ordinates added algebraically to get the resultant curve A, broken line, which is the combined tangential diagram for four cylinders

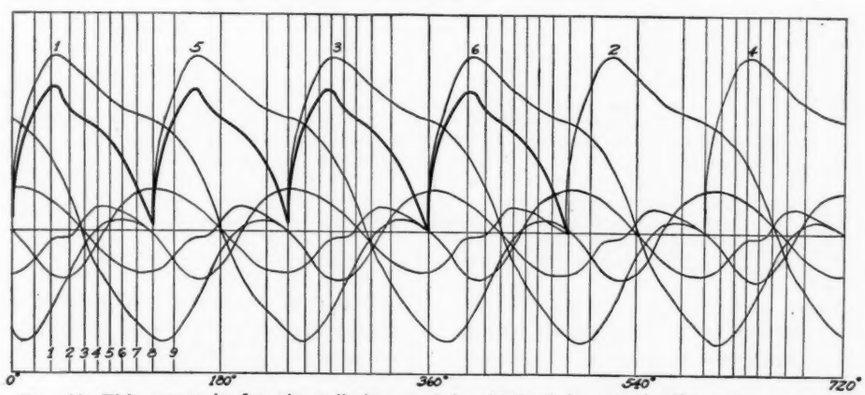


Fig. 11—This curve is for six cylinders and is obtained in exactly the same way as Fig. 10, from Fig. 8. The resultant line is the heavy line B

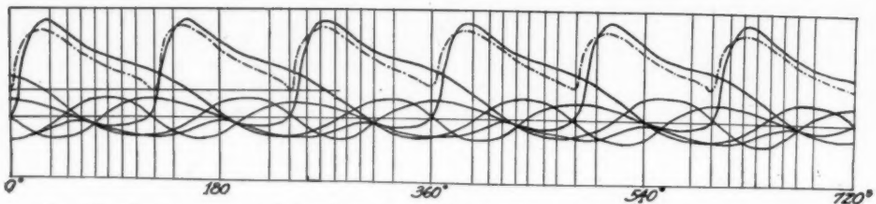


Fig. 12—The resultant of negative forces is shown in its relation to the resultant impulse curve of power forces (dotted). Although the six does not get its second cylinder into action until later than the eight, the second impulse begins when most needed, i.e., when negative forces are maximum. That is at point A, the second cylinder gets into action when the greatest negative force is acting at point B. The resultant of negative forces is obtained by adding algebraically all the negative ordinates of Fig. 12

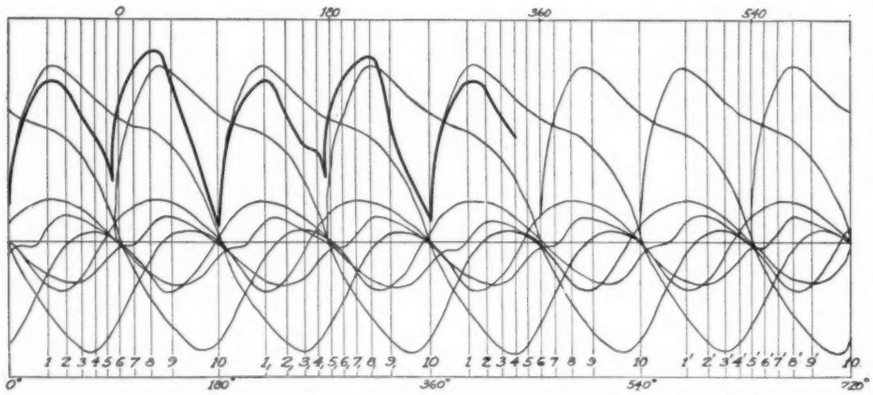


Fig. 13—This figure shows the resultant tangential diagram for eight cylinders combined in the same way as Figs. 10 and 12 from Fig. 8. The resultant line C, only a part of which is completed, shows the pressures acting at any part of the cycle as a result of the influence of 8 cylinders, considering inertia forces and working as well. We have already seen how this is done. The negative pressures are exaggerated as already explained

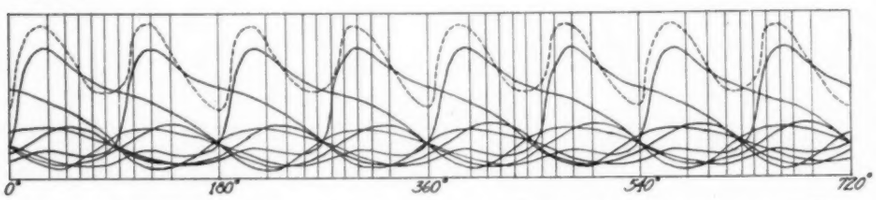


Fig. 14—A similar comparison as Fig. 13, only with an eight-cylinder motor. The overlap A comes where the negative forces are at a minimum B, or when least advantageous. The resultant of negative forces is obtained by adding all the negative ordinates of Fig. 14

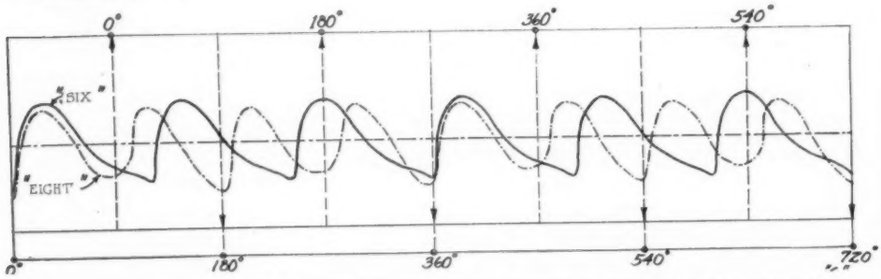


Fig. 15—A chart of superimposed power output curves of six and eight obtained as Figs. 10, 12 and 14 were obtained. Curve M is an eight, while curve N is for a six of equal displacement, power and stroke. It therefore has a larger base. The periodicity of the eight is shorter, but the amplitude is about the same. In one revolution the six has three waves and the eight four. This gives 1-3 more impulse, but not a third more torque. That is, the total of positive work of the two is the same. It is often claimed that the torque of an eight of the same power is 1-3 greater than of a six. This may be best seen by integrating and comparing the useful work inside both curves

forces, both motors have same bore and stroke; the eight has two more cylinders and consequently gives a proportionate increase in power. Upon examination we find the points of minimum torque to be approximately the same with both six and eight, which fact is due to the action of the negative forces. That is, the minimum torque ordinates of both curves are about the same.

As regards overlap of power strokes, the six does not get its second cylinder into action until later than the eight, but this actually proves to be fortunate because it comes into action at a point where the negative forces are at a maximum. This will be seen in Fig. 13 where the resultant negative force is shown below the zero line.

In the eight the *overlap comes in a place where the negative forces are at a minimum.* Fig. 14 shows this in a similar way to Fig. 12.

As was previously mentioned, exaggerated diagrams were made for the purpose of showing that the minimum torque of an eight-cylinder motor having same bore and stroke as a six with two extra cylinders acting is no higher than the minimum torque of the six with two less cylinders.

On an Equal Power Basis

The highest peak of the eight-cylinder tangent curve is higher than that of the six because of the two additional cylinders. Although, Figs. 11 and 13 represent motors of same bore and stroke, to be absolutely fair let us in Fig. 15 represent a six and an eight V or all-in-line type of the same stroke and piston displacement, the six consequently having a larger bore.

In Fig. 15, which is a summary of previous curves, we find that the power output of both six and eight-cylinder (either V or all-in-line) motors should be the same because if they are of same displacement the integral of both curves should be the same. The periodicity of the curve is shorter on the eight than on the six, but the amplitude is about the same. In one revolution the six has three waves, while the eight has four, which is one-third more impulse, but by no means a third more torque. That is, the sum total of positive work of the two motors in the same revolution is practically the same, instead of being the often-claimed 33 1-3 per cent. greater amount in the eight. This may be seen by integrating and comparing the useful work shown by both curves. Whether this could be considered an advantage or not is open to question. If there is any advantage, it is apparently small, and not near as much as the advantage gained by going from four to six, for the four has an absolutely dead period.

From what is revealed by the foregoing curves it is questionable if the advantage gained is sufficient to justify the eight-cylinder construction.

Various types of curves have been developed for eight-cylinder motors, some nearly straight lines, while at the same time similar curves for the six showed comparatively wavy lines.

It would appear that such curves have been slightly conventionalized or else the negative forces have been somewhat neglected. Had they been taken into con-

(*Continued on page* 649)

Yellow Rays Are Non-Glaring

Yellow Headlight Rays Do Not Affect Eye—Objects More Easily Seen In Colored Light

By J. W. Esterline

INDIANAPOLIS, IND., Editor THE AUTOMOBILE:—The danger of operating an automobile at night on city streets or country roads with brilliant, dazzling, blinding headlights is proven by the many accidents recorded monthly, caused by the driver running off the road while blinded with the headlights of an approaching car. Because of this situation the present controversy on non-dazzling headlights must be considered from the standpoint of the country as well as the city; and further, it must be considered from the standpoint of safety to the motoring public, as well as to other classes of traffic.

It is equally dangerous to motorists and the public to drive on city streets or country roads at night without headlights. The almost world-wide agitation against dazzling headlights is indicative of an interest in and the demand for a type of headlight which will meet the requirements of night driving on city streets or country roads.

The requirements of a headlight which will satisfactorily meet all these conditions are varied and difficult to embody in a single piece of simple apparatus. The manufacturer is called upon to produce a lamp which the driver riding behind can clearly see the street or road ahead and which persons approaching or crossing the path of the car can see at a good distance.

Some cities have passed ordinances prohibiting the use of headlights, and while this doubtless reduces the discomforting blinding, it seriously increases other dangers. There can be no objection to plenty of light if that light is not blinding, and it is positively safer to pedestrians and drivers to use the headlights, if the light they give is such as to cause no discomfort or danger.

Headlights a Necessity

The rays of a headlight are a silent warning to persons walking, and to drivers of horse-drawn or motor vehicles, of the approach of a car from behind. The light from a car approaching an intersection of streets obviates many collisions, and the sweeping of the rays of a car making a turn is a most effective signal of the driver's intentions. In the darker streets of cities, it is positively dangerous to require motor cars to operate without headlights.

A brilliant headlight sufficiently dimmed to be non-blinding, gives no driving light. Since it can be instantly controlled by the driver, the presence of a police officer is almost necessary to insure its use. Because it does not give a good light to drive by, the driver does not dim his lights except when compelled to. When they are dimmed to the point where they are not blinding, the light is so faint that it is useless as a warning signal.

While it is possible for the authorities to control the situation somewhat in the larger cities, the only satisfactory solution which will give adequate protection in the country, is the use of a headlight which will give a sufficient driving light and at the same time be non-blinding.

It will be interesting to note the reasons why we can see better in a yellow light, and why the blue and violet rays set up an almost immediate irritation.

When we look at the human eye, Fig. 1, we see through

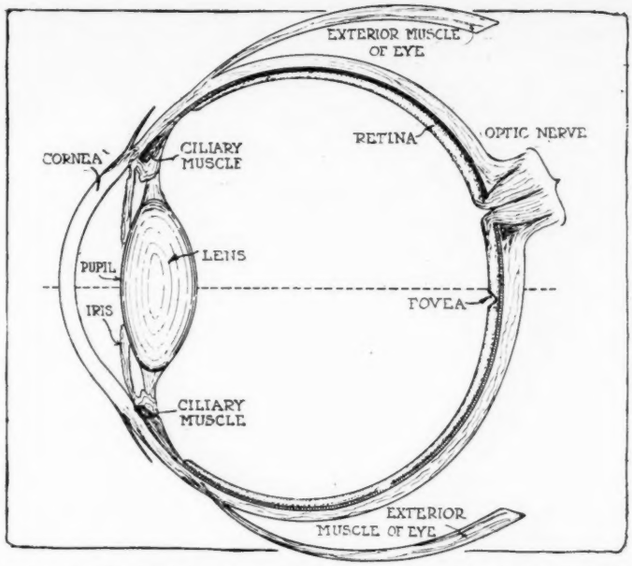


Fig. 1—Construction of the human eye. The pupil is shown at the left and the retina at the right

the clear, transparent cornea a circular colored portion, the iris. In the center of the iris is an opening, the pupil. This opening has the property of enlarging itself or contracting, according to the amount of light striking the eye. Thus, when we pass from a dark room into a brilliantly lighted room, the pupil almost instantly contracts.

It is significant that the contraction in passing from darkness into bright light is accomplished almost instantly, whereas the enlargement in passing from bright light into darkness is accomplished comparatively slowly. This strongly indicates that the function of the pupil is protective rather than regulative, which accounts for the fact that when we look into the front of a brilliant headlight for an instant we are unable to see anything else in our path.

It should be noted, also, that the range within which the pupil can enlarge itself or contract, is much narrower than the range of light intensities to which the eye is normally exposed. In other words, the protection offered by the pupil is only partial, and is not sufficient to entirely protect the eye from the bright conditions of illumination to which it is often exposed.

The Eye Construction

Close behind the pupil in the human eye, Fig. 1, lies the crystalline lens, whose function is of course similar to that of a lens in a camera. There is, however, this important difference in operation. The clearness of the image formed by the lens of a camera is maintained, whether the object is far or near, by changing the distance between the lens and the ground glass, or sensitized plate. Obviously in the human eye such changes cannot be made. The clear focus of near or distant objects is therefore accomplished by changes in the curvature of the crystalline lens. Around the outside of the lens runs a ligament, and this ligament is attached to the ciliary muscle. By contraction or relaxation of the ciliary muscle a greater or lesser curvature of the lens is accomplished.

The crystalline lens is non-achromatic. In other words, it does not bring the red rays, the yellow rays and the blue and violet rays simultaneously to a focus at the same point. Light not brought to a focus at the right point produces a blurred image, as we know from the observation of the ground glass plate of a camera when the lens is moved out of adjustment.

Yellow Ray Gives Vision

In ordinary white light, the yellow rays are brought to a focus on the retina; the blue and violet rays, in front of the

retina, and the red rays, just behind it. The distinct element of ordinary vision is, therefore, given by the yellow rays, the blue and violet rays serving only to blur the sharp outlines of the visualized object. This blurring is not always detected by close observation, but it is sufficient to require a sufficiently increased intensity of illumination on the visualized object in order that the exact outline and finer details of the object may be seen distinctly. It is clear, therefore, that the yellow is the useful part of white light and that the violet and blue can be dispensed with without altering our ability to see distinctly and with an attending degree of comfort to the eyes.

Let us suppose that we are viewing an object which is illuminated entirely by a greenish-yellow light. Let us further suppose that the intensity of illumination is just sufficient to disclose some certain detail of the object. If, now, the object be illuminated by the same intensity of white light, instead of the greenish yellow light, the fine detail previously observed can no longer be seen. A higher intensity is required to disclose this detail.

Detail in Vision and Color

Expressed in scientific terms, we can say that visual acuity, or the ability to distinguish fine detail, is in a considerable degree dependent upon the color value of the light by which the object is illuminated.

It has already been pointed out that the crystalline lens is non-achromatic. When, therefore, light having rays of all colors, as in the case of white light, is reflected from the object to the eye, the blue and violet rays are brought to a focus in front of the retina, and the red rays directed toward an imaginary focus behind the retina. The red, blue and violet rays serve, therefore, to blur the otherwise sharp image formed by the yellow rays on the retina.

Now, when the object is illuminated by monochromatic light, that is, by a light of a single color, the rays are brought to a sharp focus on the retina, and there is no blurring effect. In other words, the non-achromatic lens can adapt itself to any color of light, but in the presence of light of all colors, combined in approximately the proportion of white light, it adapts itself to the yellow rays.

Research has conclusively established that monochromatic light enables detail to be distinctly seen at a lower intensity of illumination than when the object is viewed by white light.

It has also been established that different colors of monochromatic light vary in their power to disclose detail.

Yellowish-Green Light for Detail

The power of disclosing maximum detail with minimum illumination seems to be possessed by a yellowish-green color.

From the above it will be clear that we can see more distinctly with the same light, or equally distinctly with less illumination, if that light be of a greenish-yellow color.

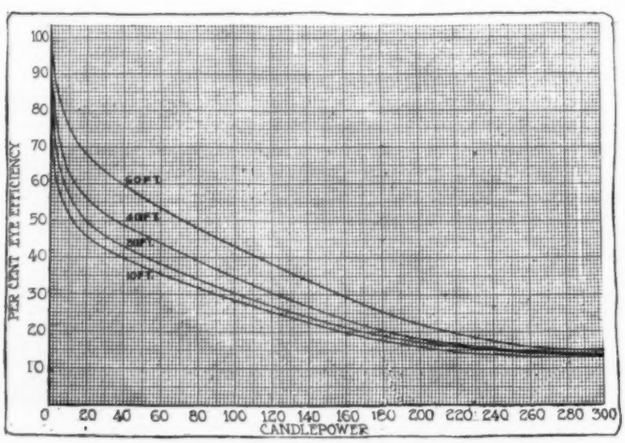


Fig. 2—Curves showing the relation between the efficiency of the eye and the candle power of the light at various distances from 10 to 60 feet

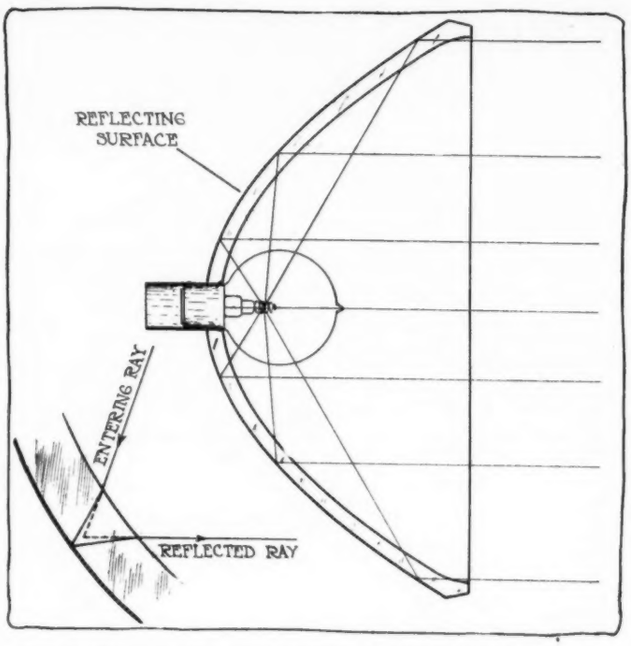


Fig. 3—Diagram showing the rays of light reflected from an ordinary headlight. In the left corner is shown the path of the ray through the glass. The dotted lines show the apparent path of the ray due to the difference in index of refraction between the air and the glass

The influence of colors of light has been studied by a number of able investigators, among whom Laporte, Broca, Dow, Bell, Ashe and Luckiesh have done especially notable work.

Cuts Eye Efficiency

In considering the question of headlights for night driving, it must be borne in mind that the human eye when constantly subjected to an intense white light reflected from the road quickly loses its efficiency. In other words, the brilliancy of the light itself reflected back into the eye of the driver, soon lowers the efficiency of the eye to a point where the ability to see is less than it would be if the light were less brilliant.

The lowering of the eye efficiency depends upon the total amount of light which enters the eye, and upon the angle with the line of vision at which each integral portion of light enters the eye.

Eye Efficiency and Brilliancy

The curves in Figure 2 show the relation between the efficiency of the human eye and the intensity of light entering the eye at 0 degree angle with the line of vision. Curves are given for the source of light at different distances from the eye. It will be observed that a very small intensity of light entering the eye along the line of vision materially cuts down the efficiency of the eye. When the intensity of the beam reaches 300 candlepower the efficiency has been tremendously reduced. These curves show clearly why when a beam of several thousand candlepower shines directly into the eye, it is impossible for the driver of a motor car to see anything in his path, since an increase of from 20 to 300 candlepower in the beam of light entering the eye lowers the efficiency from 70 to 12 per cent.

The curves also show that the efficiency of the eye is very little affected by the distance of the light source or light reflecting object from the eye.

Steinmetz on Optics

Dr. C. B. Steinmetz, eminent engineer and physicist, in "Radiation, Light and Illumination," has the following to say concerning blinding, irritating light:

"The light which enters the eye is converted into heat, and

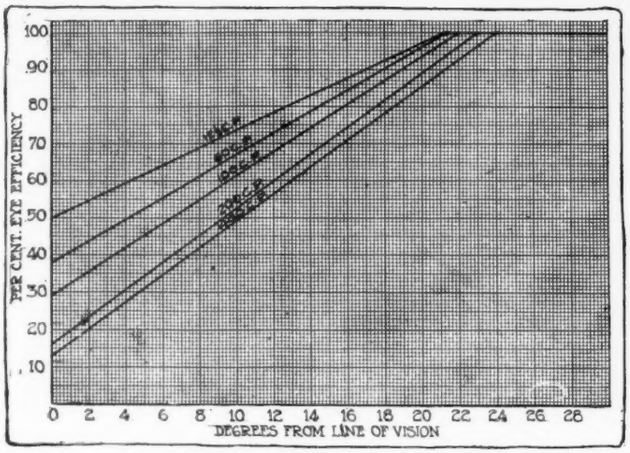


Fig. 4—Curve showing the relation between the efficiency of the eye and the angle at which the light strikes it

if its power is considerable, it may be harmful or even destructive, causing inflammation or burns. This harmful effect of excessive radiation is not incident to any particular frequency, but inherent in radiation as a form of energy. It is, therefore, greatest for the same physiological effect, that is, the same amount of visibility, for those frequencies of light which have the lowest visibility or highest power equivalent, that is, for the red and the violet, and least for the green and yellow, which for the same amount of visibility represent least power. Hence, green and yellowish-green lights are the most harmless, the least irritating to the eye, as they represent the least power.

"The human organism has by evolution, by natural selection, developed a protective mechanism against the entrance of radiation of excessive power into the eye; at high intensity of illumination the pupil of the eye contracts and thus reduces the amount of light admitted, and a sudden exposure to excessive radiation causes the eyelids to close. This protective mechanism is automatic; it is, however, responsive to long waves of radiation, to the red and yellow light, but not to the short waves of green, blue and violet light. The reason for this is apparently that all scurces of excessive radiation which are found in nature, the sun and the fire, are rich in red and yellow rays, but frequently poor in rays of short wave length."

Government for Yellow Light

The United States Bureau of Standards in Bulletin No. 28 recommends a yellow light as causing the least fatigue, as follows:

"A light yellow screen is very effective in eliminating a purple haze in viewing distant objects and thus heightening contrast in an otherwise 'flat' field. The extreme contrast produced by the direct reflection of sunlight on water cannot be avoided (being nearly non-selective), but the maximum intensity may be reduced at the sacrifice of the low lights, or the glare may be 'softened' with a yellow or orange screen which eliminates the more fatiguing blue and violet."

The Master Mechanics Association of the steam railroads of the United States, conducted a series of tests for 9 months on different types of lamps for railway use. From the report of this committee, we quote one paragraph which is of particular interest, coming as it does from the committee appointed to report on this subject, as it bears out what has already been said about the ability to see in different kinds of light:

"The headlights listed above were first tested to ascertain the distance at which dummies could be seen with the dummies standing abreast between rails. Three dummies were used—one dressed in dark blue overalls and jumper, known as the 'dark dummy'; one dressed in blue and white striped overalls and jumper, known as the 'medium dummy,' and one dressed in white overalls and jumper, known as the 'light dummy.'

"The ability to see dummies with lamps of moderate intensities is fairly well established by the visibility curves, and that there is no apparent difference in the ability to see the dummies with a given intensity of light, whether the source is oil, acetylene or incandescent lamps.

"It will be noted, however, that with arc lamp No. 19, with 60,000 apparent beam candle power, the dark object could be seen only 557 feet. Calculating from the visibility curve of the dark dummy for oil, acetylene and incandescent lamps, the dark dummy would be seen at the same distance with an apparent beam candle power of only about 14,000. This effect can be attributed only to the predominance of short violet waves in the arc rays to which the eye does not readily respond."

Cutting Out the Glare

In the "Golden Glow" headlights, non-blinding is secured by altering the *quality* of the light given by the incandescent lamp, and by this means the glaring effects are greatly reduced without appreciably altering the illuminating qualities.

In this type of lamp, a golden green parabolic glass reflector is used, the color being obtained by a special mixture in the manufacture of the glass.

Green, Orange and Yellow Needed

It is also equally well established that the colors of light of ordinary vision are the green, orange and yellow. For these reasons it is possible to remove the violet and blue rays from a beam of light, rendering it much softer and less irritating, without seriously affecting its illuminating qualities.

In the manufacture of the Golden Glow reflector, the ingredients used in making the glass are such as to give it a golden green color. The lamp bulb being in front of the reflector, and the silver reflecting surface on the back of it, it is necessary for the light in passing from the bulb to the reflecting surface to go through the glass, and on leaving the reflecting surface, it passes through the glass a second time. Fig. 3.

The colored glass subtracts from the beam of light given by the bulb all of the rays above the green, *i. e.*, the violet and the blue, and passes those of all colors below it, so that while the light given by the filament of the lamp itself is a brilliant white, the beam of light from the headlight is a golden yellow with a slight tinge of green.

We have already stated that the lowering of eye efficiency depends upon the angle at which the light enters the eye. Figure 4 shows the relation between the efficiency of the eye and the angle with the line of vision of the beam of light causing the depression. These data are of the highest value since they show that the lowering of the efficiency of the eye ceases when the angle between the beam entering the eye and the line of vision is 24 degrees or more.

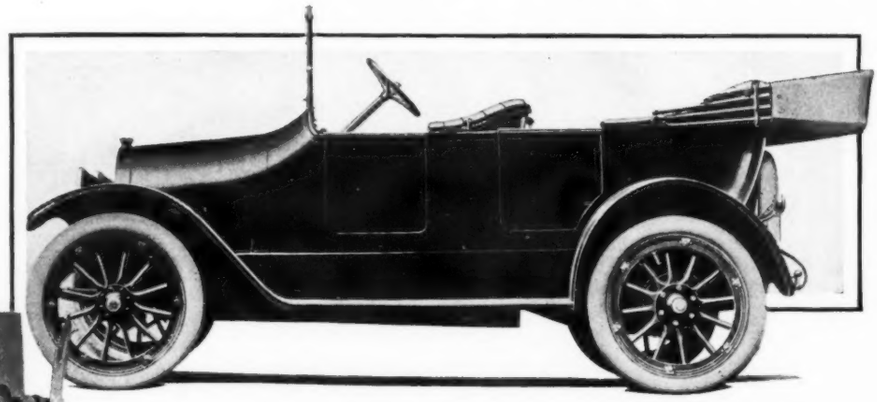
This means that on the assumption that the lamps on a motor car are on a level with the eye and that the rays leaving the lamp are parallel, all objectionable blinding would be overcome by tilting the lamps so that the beam leaves the lamp at an angle of 24 degrees below the horizontal.

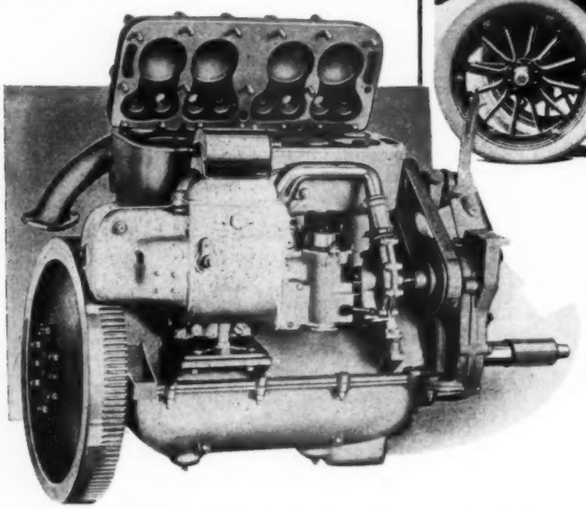
It is a fact that the eyes of persons approaching are usually somewhat above the plane of the lamps so that in most cases a tilting of the lamps by an amount equalling 15 degrees is sufficient.

Numerous tests made by this company indicate that by using a greenish yellow light, which is the light in which the eye works most efficiently, and by slightly tilting the lamps, a satisfactory roadway illumination is obtained which is not objectionable to other kinds of traffic, and which adds materially to the safety of all forms of traffic.—J. W. ESTERLINE, President the Esterline Co.

One Cartercar Model for 1915

Friction Drive Continued —Price Unchanged— New Chassis Continuation of This Year's Smaller Model—





Above—Cartercar five-passenger touring car selling for $1,250.
Left—Motor with detachable cylinder head and combined starting and lighting system mounted on the right side and at the rear of the pump

A POLICY of concentration has been adopted by the Cartercar Co., Pontiac, Mich., for the coming season which has resulted in the decision to market but one model of chassis to be known as model 9. This year was given over to the manufacture of two chassis, models 5 and 7, the former higher in price and larger than the latter.

The new model 9 is practically a continuation of this lighter model 7, though it has undergone some refinement both mechanically as well as in outward appearance.

Friction drive remains practically unchanged, it having proven satisfactory in the hands of Cartercar users in practically its present form for many years.

Price Not Changed

There has been no change in price, the new model 9 selling for $1,250 with full equipment just as did its predecessor, model 7. Only two bodies are supplied, a roadster and a touring type. These are up to date, and in changing to the streamline form the Cartercar Co gets into line with present-day demands of the buying public. Body fashion dictates a sloping hood, cowl rounding gracefully to it, round-top radiator, smooth-sided body, domed fenders with protecting edges fastened with concealed rivets, the elimination of side lights, etc. And in every one of these respects, the Pontiac concern has met these dmands in thoroughly commendable manner.

One change in the general body construction is the addition of a door to the right or drive side. This year there is no entrance here, and in order to accommodate this, the throw of the speed lever and emergency brake lever has been brought a little forward.

Lower Gear Ratio

The gear ratio in the rear axle has been lowered from 3.45 to 1 to 4 to 1. This makes the work of the motor somewhat easier and really gives the car more pulling power.

Tires have been increased from 32 by 3 1-2 to 33 by 4 inches. In addition, the rears are now non-skid, as against plain treads heretofore.

So as not to make any difference in the reduction ratio between motor and wheels, the copper tranmission disk has been decreased in diameter 1 inch which makes up for the increasing of the tire diameter by 1 inch.

Although the motor is practically the same in design as in 1914, being 3 1-2 by 5 inches, and having its cylinders cast in a block of L-head form with detachable head, it is really more powerful due to a slight increase of valve size and other slight changes. The valves now are 1 13-16 inches in diameter in the clear as compared with 1 11-16 inches formerly.

Wires in Flexible Conduits

Another noteworthy refinement is the placing of all wires within flexible conduits to protect them against any of the hundred and one conditions which would result in short circuits, broken circuits and the like. Aside from the efficiency of this type of wiring it makes a much cleaner and neater job.

The Cartercar motor is of conventional form with valves all on the left along with the intake and exhaust manifolds, the latter running back to the exhaust pipe above the intake which is of the two-branched type. The power plant rests upon two frame cross members which are arched downward. It is really three-point suspended from these cross pieces, there being two points of attachment to the rear member by means of integral projections from the upper half of the horizontally split crankcase, while the front of the engine rests upon the forward member at one point only.

The motor develops about 30 horsepower at 1,700 revolutions per minute and its cylinder dimensions give it a piston displacement of 192.5 cubic inches.

Detachable Cylinder Heads Used

The detachable head construction is noteworthy in that it allows for the complete exposure of all of the pistons and cylinders together with valve pockets and valves by the removal of the steel holding bolts. Between cylinder block and head there is interposed a copper gasket.

The working parts are standard in every respect, and are machined to close limits as well as being accurately balanced against vibration which is the enemy of quietness and smooth running. There are three main bearings for the crankshaft and three for the camshaft, both of which are drop forgings

of high-carbon steel. The cast iron pistons carry three rings each. Valves are of the standard form seating at 45 degrees, and operating through the intermediary of adjustable tappets working against the cams. The camshaft and generator and pump shaft are operated by helical timing gears completely housed at the front. There are two valve covers inclosing the valve mechanisms, and in these covers there are vents which communicate through the tappets with the crankcase and thus serve as breathers.

The motor dimensions are:

Pistons, length, 4½ inches.
Connecting-rod length, 10⅜ inches.
Piston pin bearing, ⅞ by 1⅞ inch.
Connecting-rod lower bearing, 1⅝ by 2¼ inches.
Front crankshaft bearing, 1⅝ by 3 7/32 inches.
Center crankshaft bearing, 1⅞ by 2⅜ inches.
Rear crankshaft bearing, 1 15/16 by 3 7/16 inches.
Front camshaft bearing, 1⅛ by 2 inches.
Center camshaft bearing, 2⅛ by 1 inch.
Rear camshaft bearing, 1 by 1¾ inches.
Flywheel diameter, 14 inches.

The cooling system is of the positive circulation type in which a centrifugal pump driven by the same shaft as the generator and on the right side of the engine, is employed. A large tubular radiator and three-blade, belt-driven fan do their part in the cooling.

The splash system of lubrication finds efficient application and uses individual troughs under each cylinder into which the rod ends dip. A plunger pump, operated from the camshaft, supplies these troughs from the oil base and keeps them at a constant level.

Three-Function Delco Used

The electrical part of the Cartercar is cared for by the standard form of combination Delco unit which incorporates the three functions of cranking, lighting and ignition. The ignition distributer is an integral part of the unit and the ignition current is supplied by the generator in conjunction with the storage battery. The cranking is done by the meshing of the gears with teeth in the rim of the flywheel when the pedal is pressed. This operation also transforms the unit into a motor, sends current from the storage battery and as soon as the pedal is released, the motor-generator returns to its normal condition as a generator.

Friction System Unchanged

The Cartercar drive system is of very simple form as shown in the chassis illustrations. Due to the fact that it is of friction type, a clutch, which is essential to every ordinary type of car, is dispensed with as is also the gearset with its usual three speeds forward and reverse.

From the flywheel, which is not inclosed, there is a short shaft extending back to the copper-alloy transmission disk which has a diameter of 19 1-4 inches in the new car. Due to the positive connection between this disk and the flywheel, the disk rotates at the same speed as the crankshaft and is in the same plane as the flywheel.

Back of this disk and mounted at right angles to it is the fiber-faced friction wheel, 21 1-4 inches in diameter. This wheel is mounted on a cross shaft on which it slides, the shaft having a bearing on either frame side member. At the right side the shaft carries a sprocket over which a silent chain runs and conveys the power back to the rear axle.

Thus when friction disk and wheel are in contact, friction causes them to roll together and connection is then made between motor and rear wheels through the intermediary of the differential gears in the rear axle.

The construction of the drive mechanism is very substantial and efficient from a power transmission point of view. The disk shaft and housing for the driving release spring are carried on a couple of frame cross pieces, and the shaft ahead of them is provided with two universal joints. The driving chain running from wheel shaft to axle is fully inclosed by a housing which is horizontally split into two halves and which bolt to the differential housing through flanges.

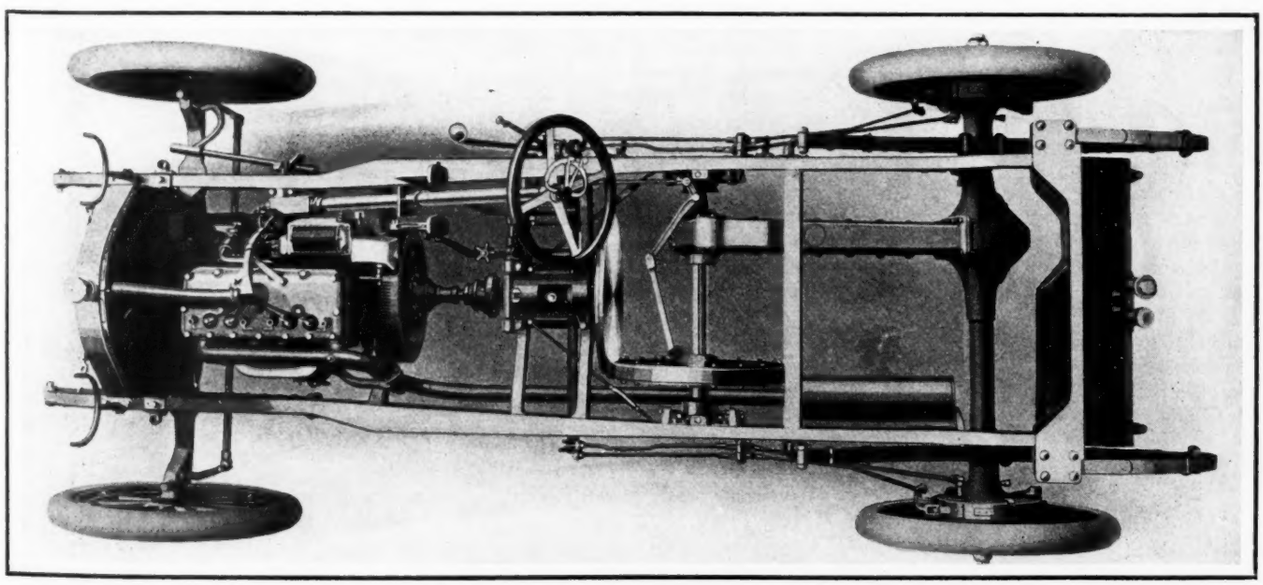
The rear axle is of the three-quarter floating type with bevel gear differential within the ring sprocket over which the chain runs. Single bearings are placed under the rear hubs, and Hyatt bearings are used for the differential.

The wheelbase of the model 9 Cartercar is the same as model 7, measuring 106 inches. The tread is 56 inches with an option of 60 inches for Southern roads.

Steering and control are on the right as heretofore, the gear being of the worm-and-nut type, operating from a 17-inch wheel carrying spark and throttle levers and horn button.

In connection with the new bodies, a convenient arrangement of the various instruments on the instrument board is made. These are all grouped within easy reach of the driver, and night driving is made convenient by the dash lamp which illuminates them.

The equipment includes a rain vision ventilating windshield, top with quick-acting curtains, demountable rims with one extra, electric horn, speedometer, gasoline air gauge, license tag holders, full set of tools and jack.



Plan view of chassis showing the location of the motor, and the details of the friction transmission and enclosed silent chain drive

Many Car Makers Strain Tires By Overloading Them

The Automobile Engineers' Forum

Car Maker Dictates Sizes—Oversize Popular Equipment—Absorb Shocks Better

BATAVIA, N. Y.—Editor THE AUTOMOBILE—We do not feel that the criticism that tires perish through cutting and not through wearing away of the tread is well founded as an argument in favor of not using oversized tires, for the reason that in the first place an oversized tire is less liable to suffer from injury by cuts or stone bruises which fracture the fabric, than the tire equipment which at the present time most car manufacturers elect arbitrarily to use on their product.

Car Maker Dictates Sizes

This latter point is the main reason why oversized tires are needed at all. The manufacturer of cars seems to occupy the enviable position of being able to dictate to most tire manufacturers what sized tire equipment they are to figure on, if they want his business, and the tire manufacturer for one reason or another generally figures the way the car manufacturer insists he shall, and this in spite of the fact that the tire manufacturer publishes a schedule showing the load capacities of these tire sizes.

Oversized tires would not be necessary at all if, in the first place, car manufacturers used sizes on their original production which carried this production, and if tire manufacturers either did, or were in the position to, compel the car manufacturer to equip with tires adequate to the weight strains.

It is just as logical for a car manufacturer or a consumer to say that there is no economy in an oversized tire as to claim that a 20-horsepower engine in a car weighing 4,500 pounds is adequate by comparison with a 40 or 50-horsepower motor for the same car. The 20-horsepower motor would probably move the car, but it would be seriously strained in doing it, just as an undersized tire is strained in carrying the same car.

The car manufacturer for the past year or two has shown an inclination to recognize the need of oversized tire equipment, and has bettered the condition which led some years ago to the production of oversized tires.

Oversize Soon to Be Regular Equipment

The car buyer is pretty well educated these days when it comes to knowing what size tires a car of given weights should be equipped with. The car buyer generally gets what he insists upon getting, even if he has to pay extra for it. What he pays extra for this year is generally next year's regular equipment, and the time is not far distant, apparently, when all manufacturers by reason of greater knowledge of the needs of the case, coupled with the element of competition, will practically eliminate the need of a tire which today is called an oversized tire, and what now is known as "oversize" will in all probability be regular.—W. P. BERRIEN, sales manager, Batavia Rubber Co.

Recent Racing Experience Favors Use of Oversize Tires

RUTHERFORD, N. J.—Editor THE AUTOMOBILE—We have found the oversize tires to give better service and considerable more mileage, easier riding than the smaller tires. Our tests have been made on various cars, and we can refer you to one case on a Chalmers coupé on which the double oversize was used with proper change of rims. Besides easier riding this set of tires stayed on the car over 15 months, giving something from 7,000 to 8,000 miles on the rear. We can also cite an instance where last year at Indianapolis the Mercedes driven by Ralph Mulford used oversize tires in the rear. The result is a published fact that the tires went through the 500 miles without any tires changed.

Previously the racing cars used about a 4-inch cross section and 4½-inch in the rear. The size tires used this year were anywhere from ½ to 1 inch larger in cross section. We cite a particular case with the foreign cars in which they used a 35 by 6-inch tire while last year they used 35 by 4½. Smaller tires make ruts in the road and are more liable to cuts than the larger casings. The larger cases have more tread than the smaller ones, and have greater carrying capacity and air space. More tires are damaged on the curves than on the straight away. The tires have a rolling effect on curves and if the cross sections are not large enough they will suffer severe cuts and blow out. The general public is beginning to realize that oversize tires are better and more economical.—BRAENDER RUBBER & TIRE CO.

Oversize Tires Have More Cushion and Absorb Shocks Easily

AKRON, O., Editor THE AUTOMOBILE:—We note that there has been some criticism on the oversize tire on the grounds that the average tire perishes from cutting and not from wearing away on the tread. This would seem to be an argument in favor of the oversize tire which has more cushion and naturally absorbs shocks and bruises to better advantage.

The manufacturers of a car necessarily adopt some standard equipment which their engineers and the tire people consider adequate to carry the weight and give satisfaction generally.

Conditions Determine Requirements

Take, for example, twenty cars that are shipped to many different sections of the country. Probably the tires on seventeen of these cars stand up and make a good showing, but the tires on three of the cars give trouble continually. It simply means that the different conditions under which these three cars are used make it necessary to use larger tires in order to secure the expected service.

The oversize tire was primarily designed and intended for these exceptions, but it is becoming a practice among experienced car owners to use the oversize tires generally and in many instances to specify them as original equipment for their new cars.

Firestone oversize tires have an extra thickness of fabric and rubber, consequently the added strength and larger air cushion of approximately 30 to 40 per cent. insure distinct advantages. The resiliency of the larger tire adds to comfort, reduces vibration to the mechanism of the car and the traction slippage on the rear wheels is less.

There is not enough difference in the extra weight of oversize tires to cause any difficulty with power, differential or rear axle. These are important things to consider, particularly with a small car.

Added strength, resiliency and mileage without expense or inconvenience of changing wheel equipment are features which mean more certainty and pleasure to motoring.—L. GREENWALD, Manager Service Department, Firestone Tire and Rubber Co.

Does Not Favor Oversize Tires—No Complaints

MILLTOWN, N. J.—Editor THE AUTOMOBILE:—In regard to oversize tires, we think it advisable to use tires made especially to fit the rims on which they are to be used.

While we are not in favor of oversize tires, we might add that we have heard no complaints from those who use them.—MICHELIN TIRE CO.

Compares 6 vs. 12-Volt Controversy to 110 vs. 220-Volt

CLEVELAND, O.—Editor THE AUTOMOBILE:—In regard to the respective merits of the six volts vs. 12 volts wire system, we are unable to express any opinion as to which is the better. From a battery maker's standpoint it makes no difference which system is used.

We think you can compare this to the illuminating system. We doubt if there is any advantage—of one over the other between the 110-volt and 220-volt. In illuminating systems there might be a slight advantage in favor of the 220-volt system due to the fact that the loss due to wiring would be less on account of the higher voltage. There is no doubt but what it would be a good thing if every one would adopt one standard, but, as outlined above, we can see no advantage of one system over the other, when everything is considered.—T. A. WILLARD, Willard Storage Battery Co.

Replies to Readers—Gives Formula for $250 Automobile

DETROIT, MICH.—Editor THE AUTOMOBILE:—I notice in your issue of September 10 an article asking for information on my Automo Pill. This request is misleading and very inconsistent. However, the articles have accomplished their purpose in one instance at least.

Reviewing the subject in every detail and refraining from sarcasm, which seems to be the basis of Mr. Britt's query, I will say I have never mentioned or prescribed the pill remedy, and were it not for the fact that Mr. Britt is all wrong, I would not be able to give any information, as he seems to answer every query he asked to suit himself.

Mr. Britt asks do I want everything standardized and continues by asking if I realize that it spells stagnation, but in another way. Why not tell us the other way. I do want everything standard that I can have standardized. To explain more fully and prove why, I will give an example of what standardization means. Supposing that all other concerns start making Ford cars identical with the present Ford in every respect. The first thing noticeable would be a reduction in price, next an increase in demand, due to reduced cost; next a refinement in detail; next better and more complete equipment and shortly we would have our ultimate two-hundred-and-fifty-dollar car fully equipped and instead of the present demand of 500,000 cars per year, we would be obliged to furnish 5,000,000. Does this look like stagnation? We will then be able to stop into any first class hardware store and buy a part just as easy as we now buy a bolt and nut for a carriage or wheelbarrow.

In query 2, Mr. Britt asks, "Is it fair to say that the U. S. Government is throwing away money when testing fuel," and answers his query by telling us that alcohol is too high in price for a long time to come. It is very evident that Mr. Britt is not aware that the Wood Waste Distillery Co. of Wheeling, W. Va., is today making a small machine that will produce 5 gallons of alcohol from one bushel of corn, which with corn at 60 cents per bushel, the average price, figures 12 cents per gallon. Does this not prove conclusively that alcohol is not too expensive; on the contrary, alcohol is cheaper and far superior to gasoline in every way, providing it is used in a properly designed engine.

Regarding the self-starting, the elimination of gears, clutches, etc. If Mr. Britt will look in the official gazette, Jan. 28, 1902, Patent No. 692,218, he will find a description of an engine that will fulfill all the above requirements, that weighs 110 pounds, develops on brake 15.7 horsepower at 2,000 revolutions per minute and is not of the Knight type either, this being impossible, as the Knight type of motors is four-cycle. Mr. Britt continues, "Strange to say, all things are best under but one condition and to produce a motor that will be equally economical under all conditions will be a feat worthy of my best efforts." How simple. All we have to do is run our present motor at a constant speed at which it operates most economically, to obtain the very result Mr. Britt so much desired.

Again, he says, "I am surprised to hear that, when I thought it was well understood, that of all the gear systems, the internal gear was the least efficient." It is a serious thing to think sometimes. In order that Mr. Britt will know I herewith give the comparative efficiency of the different gears:

Spur gears, 95 to 98.1. Efficiency tests made by Westinghouse Mfg. Co., *American Machinist*, May 5, 1910. Internal gears, 94.7 to 97.9. Foot Brothers Wks., Chicago, Ill. Bevel gears, 71 to 84, Brown & Sharp Mfg. Co. Spiral 20 to 85, depending on angle of tooth, Brown & Sharp Mfg. Co. Worm and worm wheel, 45 to 90, depending on angle and lead.

Considering that an internal gear has 25 per cent. more bearing surface on teeth than spur gears, it is very evident that the internal is for the horsepower transmitted the most efficient of all, rather than the least.

Mr. Britt then gives us the information that there is no difficulty in driving each wheel separately, but goes on to tell us we must have excessively heavy motors to do so; we must have, mind you, and here the Ingersoll Rand Co. and the Chicago Pneumatic Tool Co. are making air motors, developing 10 horsepower and weighing less than 50 pounds.

I presume I am still tantalizing Mr. Britt when I tell him that we have in use several thousand engines, of the Diesel, Secor and Hornby type, that do not use a carbureter at all.

In conclusion I will ask Mr. Britt to read a very interesting letter article on page 486 of the September 10 issue on the Two Stroke Cycle Ideal, which may help him digest this pill idea.—WILLIS A. SWAN.

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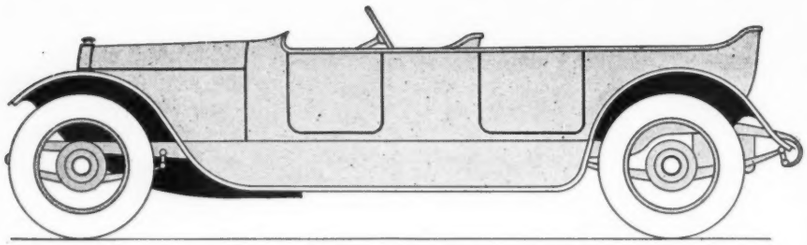
A $1,000,000 Speedway for Minneapolis

MINNEAPOLIS, MINN., Sept. 26—Incorporation papers were filed last week in South Dakota for the Twin City Motor Speedway Assn., $1,000,000, of which Francis H. Wheeler, of Indianapolis, is president, and the company plans to have the first races on the new speedway near the famous Hamline dirt track July 4. Dr. C. E. Dutton, representative of the contest board of the A. A. A., is secretary of the company and is expected to manage the races. W. D. MacLeith, of St. Paul, is the architect. Meanwhile the Minnesota Motor Speedway Co., in which H. C. Moore, of Chicago, is interested, is selling stock with headquarters at the Hotel Dyckman.



The Rostrum

Wants to Eliminate Spark-Lever Misuse

EDITOR THE AUTOMOBILE:—There are so many drivers who use, or misuse, the spark lever that I believe a contrivance of the following description would eliminate the general practice of drivers of putting the spark lever three-quarters around on the quadrant, and leaving it there through all conditions of driving. Sit beside an operator and see how he handles the spark lever.

I believe that the spark should be advanced in direct proportion to the engine speed after a predetermined minimum retard and maximum advance. By this I mean a position where the spark should occur in the stroke of the piston when the engine is idle and also when delivering its maximum output.

Attached to a shaft on the engine, crankshaft, pumpshaft, etc., a solid or flexible shafting transmits the revolutions to a dial on the dash. This dial graduates from 0 to 20; 0 represents the engine idle or ready for cranking, spark fully retarded, and 20 the engine running at maximum speed, spark fully advanced.

The mechanism on the dash works exactly like a speedometer only instead of graduating the face in "Miles," graduate it in any desired number of parts. The combined number of parts equals the throw of the finger or minimum and maximum revolutions per minute.

The spark lever is now fully retarded and the spark set to occur in the stroke of the piston just as prearranged, and to also fire the charge, when the spark lever is fully advanced, at just that point in the stroke where we predetermined it was best practice when the engine is delivering its greatest horsepower.

Quadrant in Twenty Parts

The spark lever quadrant is divided into twenty or the same number of parts as the dial on the dash. It is not necessary to use guess work where the spark should be set, nor wait for a knock and then hurriedly retard the spark which is nine out of ten times retarded too far. Simply glance at the dial and set the spark lever opposite the number on the quadrant which the finger on the dial indicates.

I realize the automatic spark advance is ideal, but my contrivance costs a great deal less and still has the advantage of leaving the spark manipulation under the complete control of the operator. With the automatic spark there is a chance of the governor going out of commission, with good chances for a broken arm. At the least, faulty ignition would result.

You may answer me by saying that most of the later cars have self-starters. I acknowledge that, but there are very few cars that go an entire season without having to resort to the cranking handle snugly resting in some obscure corner of the tool box or under the seat.

Elmhurst, L. I. GEORGE W. GAY.

Deprecates Driving on Left

Editor THE AUTOMOBILE:—I inclose clipping from a recent issue of the Hartford Courant—read it—noting the portions underlined:

"George M. Landers, democratic candidate for lieutenant governor, had a run in late this afternoon with Fred N. Tilton, proprietor of the Atlantic Screw Works in Hartford—not politically, but automobilwise. Neither was hurt, although the circumstances were such that they considered *their escape from serious injury miraculous.*

"The traffic on the river road was unusually heavy and Mr. Landers's car was making slow progress. At the crest of a hill near the home of Cornelius B. Noyes in what is known as the Walkley Hill District, he hugged the side of the road to avoid a collision with a Ford car which was coming in the opposite direction and which Mr. Landers and Mr. Tilton aver, was taking up too much of the road. *Mr. Tilton, who had been traveling in back of the Ford car, was annoyed by the "road hogging" tendencies of the driver of the Ford car,* and turned his car to the left, as is the custom on the road in passing other cars. In doing this, however, he found himself confronted by Mr. Landers's machine. He tried to steer clear of the car and avoid going down a deep ditch, but was unsuccessful in getting by and struck the runabout so that the wheels of both machines were locked. The force of the impact was sufficient to put both cars out of commission, but not to throw them off into the ditch."

It interests you and everyone else connected with THE AUTOMOBILE. It is a sorry emphasis on the fact that many drivers of left-hand-drive cars do and will persist in driving to the left of the center of the highway.

In commenting on this fault I have exhausted all the choice brands of profanity I learned as a kid in the high school. I saw those two cars and believe me—talk about the Cathedral at Rheims—say—they were a sad sight, and it is a wonder no one was killed.

For the benefit of some of the good fellows who are driving the left wing of the Ford and allies, I wish you and others would nail to the mast of each editorial column the slogan—"Keep to the Right!" You'll agree with me it would go a long way to insure safety first.

Middletown, Conn. CHARLES H. COLES.

Use of Two Casings Unsuccessful

Editor THE AUTOMOBILE:—I notice in your issue of September 10, Mr. W. B. Duling's letter asking for others' experiences in using casings over other casings and wish to state that the writer has tried to get service out of old casings which were rim-cut and tread in good shape by putting same over another casing of which the tread was not so good, but have never been able to get casing to stay on for more than 5 or 6 miles, and would say that it is too much of a job to put casing on and inflate the other one every 5 miles.

If any of your readers have found a satisfactory way to keep outside casing intact, would appreciate hearing how it is done.

Gadsden, Alabama. L. C. KYLE.

Troubled With Slipping Clutch

Editor THE AUTOMOBILE:—I have a 1911 ———— model 30 roadster. It has a multiple-disc clutch which never fails to slip or let go entirely on a hard pull or any other pull after it gets warmed up. The oil splashes through from transmission to some extent, which has been taken into

account in experimenting. No kind of oil, thick or thin, much or little, does any good. The only success comes from using heavy oil which makes it drag badly when cold and then slip when warm. The heavy oil seems to help hold the plates until warm, contrary to most disc clutches. All adjustments are all right and a stronger spring did not help. As you probably know, this clutch has given trouble on all cars of this model. The factory advised new discs, which helped for about a week, proving it is the slightly rough surfaces that tend to make the plates hold and roughening the plates is the temporary remedy practiced where these cars are in use. The discs in this clutch are about ten in number, 3-16 or 1-4 inch thick and about 6 inches in diameter. The front bearing depends on oil, splashed by the clutch for its lubrication, although a grease cup could be easily fitted.

There is no clutch brake. Will you kindly give me your opinion on the following:

—1—Will it help this clutch to double the number of plates, using thinner ones, of course?

2—Should alternate steel and bronze be used?

3—Could all steel be used?

4—Can you suggest any other probable remedy whatever?

Olympia, Washington. IVAN L. CREED.

—Your clutch trouble is probably due mainly to worn out disks, although there may be other difficulties also. One or more new disks should be added to compensate for the wear.

It is also of great importance to use a proper lubricant. A heavy oil is not desirable, but you should use a mixture of kerosene and a light lubricating oil. One-third kerosene and the rest lubricating oil is recommended.

1—We would not advise you to use double the number of plates but to just add one plate. The clutch does not need surface, but the slipping is due to the fact that on account of wear in the plates not enough pressure can be produced by the spring. This can be overcome in the manner suggested, namely, by putting in another disk.

2—Alternate steel and bronze disks might give better wearing qualities, but as already stated there is no necessity in putting in more than one new disk.

3—This is answered in two.

4—This is answered in the first paragraph.

Explanation of Cone Clutch Operation

Editor THE AUTOMOBILE:—Will you please explain the working of the cone clutch? Illustrate it if possible.

Canton, Ohio. R. EDWARDS.

—1—A typical cone-clutch construction is shown in Fig. 1. One member of the clutch is the flywheel itself and the other is the clutch spider which in this case consists of a sheet steel stamping faced with leather. The spider is made to rotate with the flywheel by forcing it against it by means of the coil spring shown.

Should Use 1-Inch Carbureter

Editor THE AUTOMOBILE:—1—What size carbureter should a person have for a 3 1-2 by 4-inch four-cylinder engine? I am using a model L 1-inch Schebler and I have tried every way to adjust it so that the cylinders will all hit on load, but as soon as I pull the throttle open it begins to miss. I have had new rings in, the valves ground and have had the best here to try and adjust it, but cannot get it any better. I even sent it back to the factory and had all new parts put in thinking that they might have done something to it in the garage they ought not to have done, but still it is no better.

Portsmouth, O. J. HOWARD SUTTON.

—1—A 1-inch carbureter is correct for your motor. Possibly the mixture should be heated or there is a leak in the intake manifold. Also inspect the ignition system carefully. See that the spark plugs are cleaned, in good condition and the gaps 1-32 of an inch. All insulation should be good, all connections tight, and no short circuits. The breaker points should be in proper adjustments and all brushes should make good contact and contacting surfaces should be clean. It is possible that there is a short circuit or a loose contact in the switch.

Points in Overhauling a Car

Editor THE AUTOMOBILE:—Will you please tell me what to do to overhaul my car? I have a general idea as to how the work should be done, but I want to make sure that I do not miss anything and would also like advice on any work that I may not be thoroughly familiar with.

Mt. Vernon, N. Y. H. W. F.

—A book could be written on this subject, but we will try to cover the main points briefly.

There are three considerations of prime importance in overhauling a car; thorough cleaning, adjustment of parts for wear and replacement of parts which cannot be adjusted.

Flush Cooling System

Under the first heading comes the flushing of the cooling system to remove any grit or dirt that has collected. At the same time, it should be noted whether there are any loose pieces that might obstruct the passageways. Grease and dirt in the cooling system may be removed by using a solution of washing soda in hot water. Stir in as much washing soda as will dissolve. It is not advisable however, to allow this solution to come into contact for any length of time with the aluminum parts. Spark plugs should be carefully cleaned, the carbon removed from the cylinders and the motor should be flushed with kerosene to remove any gummed oil.

Clutch Cleaned

The clutch facing should be cleaned with kerosene and if it is of leather, it should be soaked in neats-foot oil to soften it.

The gearset should be thoroughly cleaned. This is especially desirable because during the operation of the car a certain amount of grit collects from the lubricant. The same advice applies to rear axle and wheel bearings.

The various wearing parts should be adjusted or replaced depending upon how badly they are worn and whether any adjustment is necessary. The amount of wear that is allowable depends somewhat on the parts. If it is enough to be noticeable when shaken by hand, they should be adjusted or replaced. For instance if there are shims between the caps and the connecting-rod ends, one or more of these should be removed as required,—or if not, a slight amount of material should be removed.

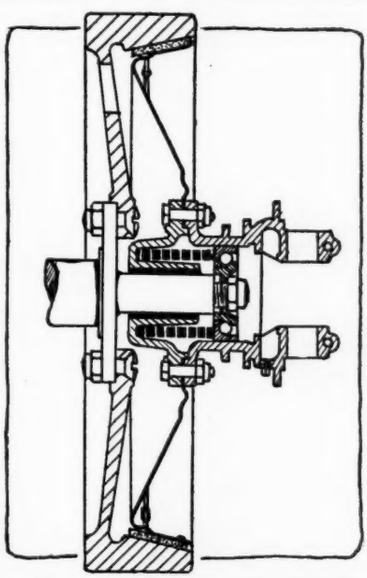


Fig. 1—Cone clutch construction

Care must be taken, however, not to draw these caps up too tight. This advice applies to all other plain bearings. Where

a bearing is badly worn, sometimes this adjustment will not be sufficient and the bearing will require rescraping. This, however, should be done by a man who has had experience.

Some types of ball and roller bearings are adjustable, while others are not. Cup and cone ball bearings can be adjusted and also conical roller bearings. Care must be taken, however, in adjusting these bearings not to draw them too tight. They should be just tight enough so that there is no play but not so they will bind.

The adjustment of the steering gear depends largely upon the type used as in other adjustments, it should only be made tight enough to remove the play. The brakes should be drawn up as tightly as possible and yet not enough so that they will dry.

The valves should be ground to remove the pits, and after this is done the push rods adjusted until there is about 1-100-inch clearance between every valve stem and push rod.

Valve Caps Are Stuck

Editor THE AUTOMOBILE:—I have an E. M. F. 30, 1912 model, and started to overhaul the motor, but found the caps over the valves were put in with white lead on the threads, which is so hardened that it is impossible for me to remove them. Can you suggest some method for removing these without breaking them?

Akron, Ohio. LOUIS GIEBEMATH.

—This is an unusual difficulty. Soften the white lead, if possible with kerosene, or oil, and if this will not loosen them up, force will have to be exerted. You should be able to start them with a cold chisel and a hammer.

Information on 1910 Cadillac

Editor THE AUTOMOBILE:—1—Kindly inform me how to determine when the front wheels are out of alignment? Also what can I do to straighten them up?

2—If the axle knuckle is bent, should it be heated? Should it be allowed to cool naturally, or must it be tempered in water? And how long?

3—What causes my car to jerk or miss? When starting it runs all right on first and second speeds, but so soon as I go into third or high gear it starts to run in a jerky manner. If I go back into second speed and push on the accelerator a little to give the engine more speed, for about half a square, and then go into third or high speed it will run all right.

My car is a 1910 Cadillac, in good condition. The spark plugs are clean and spaced correctly. The magneto was cleaned and adjusted and timed by a Cadillac man. This instrument is a Splitdorf low tension. Would this trouble come from the magneto and coil or carbureter? I have a new model K. Schebler carbureter, put on about six months ago. I have tried both rich and lean mixtures, but with the same result. This trouble has not been evident during the past week. Do you think it was the mixture, magneto or coil?

4—At this time of year should the air on the main intake pipe be heated by hot air pipes taken from around the exhaust pipe, or should the hot air pipe be disconnected? The auxiliary air is not heated.

Philadelphia, Pa. JOHN P. TULL.

—1—The alignment of the front wheels can easily be determined by measurement. With the wheels pointing approximately straight, measure the distance between the two wheels, at the front and rear. They should be ¼-inch nearer at the front, but not any more. The adjustment is made by shortening or lengthening the tie rod.

2—It is best to replace the axle knuckle if it is bent.

3—It seems most probable that the motor is missing or at least does not run smoothly at low speeds.

Adjust the spark gaps on the plugs to 1/32 inch, tighten all wiring connections, and look for short circuits caused by poorly insulated or bare wires.

See that the brushes on the magneto are in good condition and adjust the breaker points, if they need it. There may be a temporary short circuit in the switch at times.

Adjust the carbureter carefully. The air valve is for high speed and the needle valve for low.

Test the compression. It may be that the valves need grinding, or there is a leakage past the pistons or the valve stem guides.

4—It is better to heat the air all the year round.

White Steamer Boiler Clogged

Editor THE AUTOMOBILE:—I have a 1908 White Steamer, model K, and as you know the sides of the hood over the motor are ventilated. Here is where I made my mistake. I closed these openings to improve the appearance of the machine. On August 19, I made a trip to Palmyra, N. J., from Camden. After I had run two thirds of the distance, my engine overheated and stopped. I then opened these ventilators on side of hood, left it stand about 10 minutes and started off again, pumping oil to cylinders continually for about a mile. The result being, my boiler stopped, clogged, I think, from an excessive amount of oil. Can you tell me what will clean the boiler or remove the obstacle? The steam supply shut off instantly. I have used washing soda and lye. I can get a small quantity of water in the boiler by means of a hand pump.

Camden, N. J. ROBERT W. MAY.

—To overcome this difficulty, it is necessary to heat the part which has been stopped up and turn through it alternating sand and compressed air blasts. You had best go to the nearest White service station to have this done.—ED.

Valve Timing of Hotchkiss Motors

Editor THE AUTOMOBILE:—1—Kindly let me know the correct valve timing for Hotchkiss cars of the following types: 1905, motor type J; 1907, motor type T; 1914, motor type A D 6.

2—Where can I obtain a crankcase bottom for a 1915 type J, Hotchkiss motor, other than from Paris?

Roxbury, Mass. SAMUEL S. MARKOW.

—1—The actual time of the opening and closing of the valves of these models is unobtainable but if you desire to set the valves correctly, this may be done by bringing the piston, on one cylinder, 1-16 inch beyond top dead center. Then set the intake camshaft so that the intake valve in this cylinder is just ready to open. This applies to the J and A D 6 models, which have L-head motors. The T has a T-head motor and while the instructions given apply to the intake camshaft the exhaust camshaft remains to be set. This shaft may be timed without moving the pistons. Set the shaft so that the exhaust valve on this cylinder is at the point of closing.

2—It is impossible to obtain a crankcase for this model at the present time. We would advise you to have your present crankcase welded. If you have the facilities for doing this, proceed as follows:

The metal can be welded either with or without a flux, but it is preferable to do the work without one for the reason that the flux hardens the metal. The reason for using the flux is that it makes the solder more fluid and therefore it is a little easier to do the work, but when all the conditions are right and with a certain amount of experience the operation can be performed almost as readily without its use

and with the result that a much stronger joint is formed between the edges of the members.

Before welding, the metal should be scraped and cleaned and if the stock is more than .25 inch thick, it is advisable to chamfer the edges. Pieces that are of such shape as to undergo strains when heated at the fracture should be heated all over by placing in a charcoal fire, using natural draft. The temperature should be between 300 and 400 degrees below the melting point. This can be determined in two ways. The heat should be sufficient to melt the solder stick or cause a drop of water to sputter on its surface.

When this is done remove the piece from the fire and cover it with asbestos sheets leaving an opening where the weld is to be made.

The oxygen acetylene flame should be reduced or softened by using an excess of acetylene to a degree that will be indicated by the extension of the acetylene cone to 1 to 1.5 inches beyond the white cone. This excess of acetylene does not injure the aluminum but merely lowers the flame temperature to the most desirable point. Sufficient pressure should be used on the torch to force the melted solder well through the fracture so that a ridge of solder will be formed on the other side.

An iron rod hooked at the lower end should be used to puddle the solder into the crack and this rod should be wiped frequently so that it will not become coated. After the joint is made the piece should be turned over and the ridge of metal on the other side should be smoothed off by means of the torch and puddle iron.

The secret of a successful weld lies in making thorough preparations and in doing the actual welding with almost feverish haste. The solder should be applied as soon as the piece is removed from the fire and if the application of molten metal to the crack is not continuous until the work is completed the joint will crack on cooling.

After the weld is made it should be covered completely to protect it against drafts and allowed to cool slowly.

Magneto Timing Advanced for Racing Cars

Editor THE AUTOMOBILE:—1—Is a magneto timed the same for racing as for touring?

2—How large a gap should the breaker points have and what determines the size of gap?

Sterling City, Calif. ELMER MARIAN.

—1—The setting of the magneto is generally advanced on racing cars, the amount depending somewhat on the speed of the motor and design of the magneto. It is quite usual to set the magneto so that the breaker points separate when the piston is 1-2 inch below top dead center.

2—The size of the spark gap depends somewhat on the magneto, the adjustment for different instruments varying between 1-64 and 1-32 inch. If the parts are adjusted so that the gap is too large the motor will not operate at slow speeds or at least will miss, while if the gap is too small missing will occur at high speed.

In the former case the breaker points either are set so that they do not touch at all or so that poor contact is made. This condition also occurs when the points become badly worn and jagged and this is the reason that when the magneto has been used for some time the motor will miss at slow speeds and it becomes necessary to smooth off the points and readjust them. This trouble is aggravated because the voltage generated by the magneto is at its lowest and for this reason the motor will run better on the battery, providing a dual system is used.

At high speed there are two factors to consider. If the gap is too small there is danger of the current arcing; that is, when the points separate a spark is produced. When this occurs the motor misses.

This is due to the fact that the voltage is greatest at high speeds and therefore while the arcing occurs under these conditions the points are not close enough together so that it will occur at slow speeds. It will not occur at slow speeds because the voltage is less.

Too large a gap may cause missing, for the reason that the inertia of the breaker arm is so great that the spring cannot bring the points together and close the circuit before the next break begins to occur. Furthermore, with the points far apart the hammering action is more pronounced and the points flatten out.

Companies That Manufacture Automobile Heaters

Editor THE AUTOMOBILE:—Do you think it is possible for automobile manufacturers to run a pipe line from the exhaust to small flat heaters on the floor to warm the cars in the winter? We appreciate the removing of the exhaust away from the floor for summer driving but it seems that heaters could be arranged at not a very great additional expense for the winter.

2—Do you think that the detachable top, such as the Kisselkar has, will gain favor?

Detroit, Mich. A SUBSCRIBER.

—1—It is not only possible to heat an automobile in the way you suggest but there are many devices on the market for this purpose. Among these may be mentioned the Four-In-One heater manufactured by the Auto Heater Co., of America, 1148 Bedford avenue, Brooklyn, N. Y.; The Garrison combined Heater & Muffler manufactured by the Garrison Gasoline Engine Specialties Co., 251 East Richmond street, Philadelphia, Pa.; The Radio Auto Heater made by the Milwaukee Auto Specialty Co., 715 Chestnut street, Milwaukee, Wis.

Hot water heaters that obtain their heat from the exhaust are made by the Peerless Radiator Co., Gibbs, Idaho and the Robinson Auto Heater Co., Milwaukee, Wis.

Foot warmers that employ a special fuel in the form of briquette are manufactured by the American Electric Co., State and 64th streets, Chicago, Ill., and by Lehman Brothers, 10 Bond street, New York City.

2—It is very difficult to give an answer to this question, because there are so many considerations affecting this.

Picric Acid Increases Power

Editor THE AUTOMOBILE:—As I remember, the racing cars, or even owners desirous of getting more mileage and power, use a certain amount of kerosene with picric or citric acid. Am a little hazy on this subject and will you please advise me what per cent. is used or whether the ingredients are as per the above. Or what is used for this purpose?

New York City. EVERETT WARD.

—Using picric or citric acid or ether in motor fuel gives a much snappier explosion and therefore more power. The proportion is about 1 pint of any of these to 5 gallons of gasoline. It is necessary, however, to keep the spark down. Racing drivers do not adulterate their gas this way as it is against the rules of the A. A. A.

Questions on Buick Model 21

Editor THE AUTOMOBILE:—1—Will you please explain how to adjust the bevel pinion and large bevel driving gear on the Buick model 21? W. R. C.

New York City.

—1—The beveled gear on this model is adjusted as follows: First remove the small plate on the axle housing back of the pinion. This gives access to a nut which may be turned to the right or left as desired. Tightening this nut will force the bevel closer to the crown gear and thus compensate for the wear.

The Engineering Digest

System for Choosing Gear Speeds and Securing Easy and Natural Shifts Under All Conditions

STRONGLY FAVORING HOGBACK POWER CURVES

ENGINEER F. ACHILLES, of Mannheim, Germany, advances the following new viewpoints with regard to the simplest method for determining suitable proportions among the different gear speeds of a motor vehicle:

Usually the idea of horsepower as a unit dominates when the work of an internal-combustion motor is under consideration, but for the present purpose something is gained by analyzing the work output of the motor more closely and mentally dissolving the horsepower unit into its constituent elements, force and velocity. Fig. 1 serves to keep before the mind the great difference which exists between the so-called theoretical power curve, which is a straight line based on an assumed proportionality of power and number of crankshaft revolutions per minute, and the curve showing the power which can be actually delivered; also the difference between the theoretical curve representing either force or torque as being independent of motor speed and therefore as a straight horizontal line and, on the other hand, the actual torque curve, which drops considerably toward the high-speed limit of any given motor.

From the torque available at the crankshaft it is easy to determine the curve representing the forward pull at the rim of the driving wheels for any one of the gear speeds, with a given diameter of driving wheels as well as a given direct transmission ratio determined by the bevel gear proportions. This is done in Fig. 2 for three assumed total gear reductions, and the drawing serves to fix in the mind those actual relations between the motor power curve and the different curves representing the pull at the wheelrims, which are of importance for the choice of the intermediate gear proportions.

It is first noticed that the maximum wheelrim pull occurs at a certain motor speed and drops off more or less rapidly with either increasing or decreasing number of revolutions.

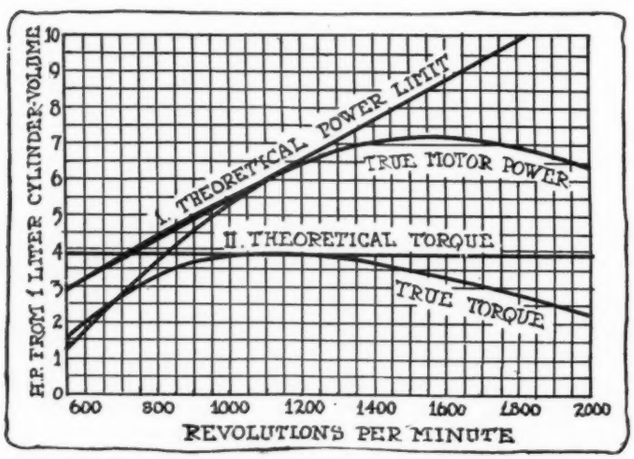


Fig. 1—The first elements determining driving comfort

Turning to the motor power curve, it is seen that it rises when the speed giving the highest wheel pull is exceeded and then again declines, first to the same level as at the speed giving maximum wheel pull and still more at further increase of speed. The efficient range of the motor is therefore naturally limited to the zone between the speed giving maximum wheel pull and the higher speed giving the same power but a considerably smaller pull. The two verticals in Fig. 2 indicate the limits of this zone. The meaning of these relations is clearly that at the low-speed limit of the efficient range strong traction power is available at low vehicle speed, while at the other limit only a smaller traction resistance can be overcome at the higher vehicle speed. In the operation of a motor vehicle it follows that the vehicle runs fast, when the traction resistance is small, on any given

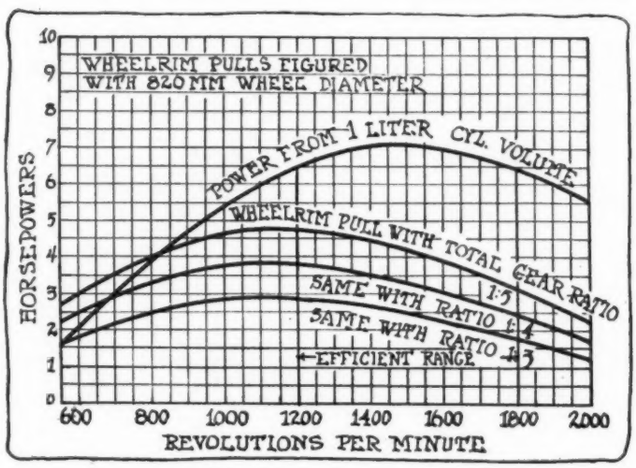


Fig. 2—Type of power and torque curve relations making for continuity of vehicle speed

gear, and the motor speed high, and that, if the resistance increases, both motor and vehicle slow down until finally the required wheelrim pull equals the maximum pull for the gear that is in mesh. Then it becomes desirable to shift to the next gear under such conditions that the reduced pull at the upper efficiency limit of the new gear suffices for overcoming the existing resistances by means of the higher motor speed coupled with the greater gear reduction. If it is now demanded that the available pull at the high limit of the new gear shall correspond with that obtained at the low limit of the previous higher gear—and this is the condition for smooth continuity in the driving conditions—then the proportion of the two gears must be chosen equal to the proportion between the wheelrim pulls at the two limits of the efficient range.

As, on the other hand, the traction resistance depends upon the vehicle speed, the demand should be made that no change in vehicle speed shall occur by reason of the shifting of the gears, in order that no sudden change in the required wheelrim pull may result. From this follows the second condition for a correct choice of the gear proportions; namely, that the total transmission ratios on the different gears also must be in the same mutual proportions as the motor speed figures at the two limits of the efficient range.

Altogether it is thus to be observed:

The proportion between two successive gear speeds must be chosen so as to be exactly the same as that between the available wheelrim pulls at those limits for effective operation of the motor the numbers of revolutions for which stand inversely in the same proportion as the wheelrim pulls.

This can be expressed more easily in the formula:

$$\frac{U_1}{U_2} = \frac{Z_2}{Z_1} = \frac{n_1}{n_2}$$

in which U signifies the total transmission ratio, Z the wheelrim pull and n the number of revolutions.

If the gear speeds are chosen so as to stand in these mutual relations, the motor must always work efficiently, and uniform transitions, accommodating themselves to the force and vehicle speed of the previous gear, will be obtained. And wherever in practice the gear proportions have not been chosen on this plan, the motor will automatically tend to adjust itself to the same manner of operating, unless a throttling of its power is the result, with the accompanying less profitable utilization of its possibilities.

When the two limits of the efficient range have been determined in accordance with this plan, and one turns

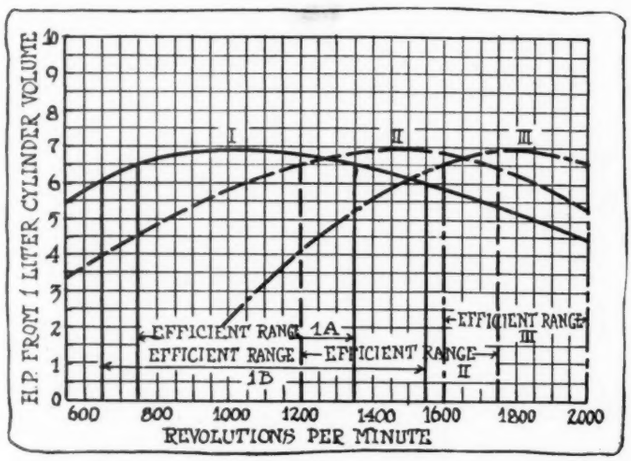


Fig. 3—Illustrating effect of motor type on gear ratio

again to examine the brake-power curve in this connection, it becomes plain that the power output always must be the same at these two limits if the wheelrim pulls are to be inversely proportionate to the motor speed figures. This would naturally be supposed to be the case, but it follows also from the equations expressing values for the wheelrim pull at the two limits, for a total transmission ratio X. For the lower limit this equation is: $Z_1 \cdot X = \frac{716\ N_1}{n_1}$

and for the upper limit $Z_2 \cdot X = \frac{716\ N_2}{n_2}$

[These are derived from the basic formula for deriving torque from horsepower:

$$M = Pr = \frac{60 \times 75\ N}{2\pi} \quad \frac{N}{n} = 716.197\ \frac{N}{n}$$

in which M is torque, N horsepower, P brake pressure in kilograms, r the radius in meters, n number of revolutions. Z in this case of course corresponds to M.—Ed.]

It is seen by dividing the first by the second equation that to have $\frac{Z_1}{Z_2} = \frac{n_2}{n_1}$, horsepower N_1 must equal horsepower N_2.

The range of motor speeds to be utilized is therefore determined by limits at which the horsepowers, N_1 and N_2, are equal, as in Fig. 2.

This is illustrated by examples in Fig. 3. The slow-speed

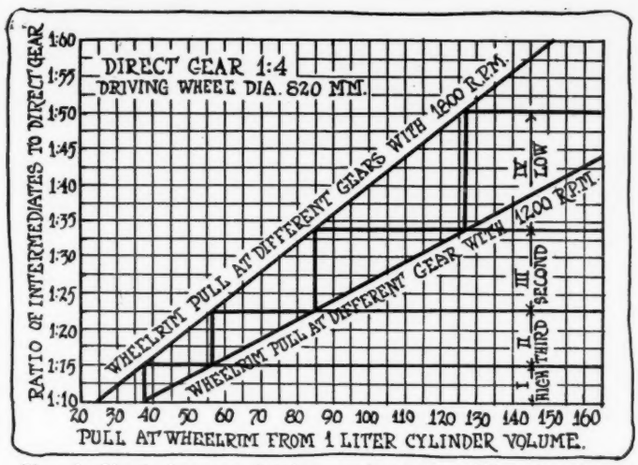

DIRECT GEAR 1:4
DRIVING WHEEL DIA. 820 MM.
RATIO OF INTERMEDIATES TO DIRECT GEAR
PULL AT WHEELRIM FROM 1 LITER CYLINDER VOLUME.
WHEELRIM PULL AT DIFFERENT GEARS WITH 1800 R.P.M.
WHEELRIM PULL AT DIFFERENT GEAR WITH 1200 R.P.M.
LOW
SECOND
THIRD

Fig. 4—Chart for ascertaining car's road ability in advance

motor represented in brake-power curve I is to be utilized in one case with a minimum output of 6.5 horsepowers per liter of cylinder volume. The motor speed limits lie then at 750 and 1,350 revolutions, and the efficient range is that marked I. A. The proportion between these figures is 1.8, and the division into gear speeds must be made with this factor. In the case indicated by the efficient range I. B the same motor is to be utilized down to an output of 6 horsepowers, and the range of motor speeds must accordingly be extended from 650 to 1,550 revolutions per minute. The proportion regulating the gear speeds consequently becomes 1,550 divided by 650, or 2.38.

The medium-speed motor represented in curve II when utilized above 6.5 horsepowers ranges from 1,250 to 1,750 revolutions per minute and requires a proportion of 1.46 in the gears, while curve III of a high-speed motor, ranging from 1,600 to 2,000 revolutions, calls for gears proportioned with a progressive factor of only 1.25. [The diagram is slightly misleading by ignoring the difference in power which would be expected from 1 liter of cylinder volume in three motors of very different speeds, but for mere illustration purposes this discrepancy is evidently not essential.—Ed.]

In this connection there is yet to be observed that the lower limit of the motor speed range must not extend beyond the peak of the wheelrim pull curve. On the contrary, to be assured of sufficient power at a gear change to maintain the vehicle speed unchanged, the wheelrim pull curve must decline steadily from the low limit toward the high limit of motor speeds.

In accordance with all the foregoing, the method of choosing the gear speeds for given conditions is now characterized by the following proceedings: (1) Tracing the power curve of the motor from brake tests, (2) constructing the curve of the wheelrim pull or torque according to the total transmission ratio—equal to that of direct gear—and the diameter of driving-wheels, (3) determining the number of motorshaft revolutions at which maximum driving torque is obtained, and (4) choosing the low-limit motor speed, preferably a little higher than that giving maximum torque, whereafter the high-limit motor speed is chosen at the number of revolutions beyond the power peak giving the same power as the low limit speed. The proportion between these speed figures is the proportion to be incorporated in the gears to obtain continuity of vehicle speed with varying traction resistance. If this proportion is changed, the range of motor speeds to be utilized is changed automatically in practice.

An example may be taken from Fig. 2. The efficient range there lies between 1,200 and 1,800 revolutions, the wheelrim pulls with the assumed transmission ratio of 1 to 4 amount to 36 and 24 kilograms respectively, the power at both limits at 6.5 horsepowers, and the proportion 1,800 : 1,200

= 36 : 24 = 1.5 : 1 must also be that of the gear ratios.

Assume that the proportion in gear ratios is chosen 1.4 : 1 instead, then the utilized range of motor speeds will be changed to from 1,240 to 1,740 revolutions and other values correspondingly. If, to get the extreme maximum of wheelrim pull, which is obtained at 1,150 revolutions, the low limit is placed at the same point, the other limit will be extended to 1,850 revolutions, and the factor of gear progression will become 1.6 : 1. Are thus the two limits determined, the available wheelrim pulls can be figured out and consequently also the maximum grades which the vehicle will be able to climb on each of the gears, if the different traction resistances are also considered. To this end it is only necessary to chart the wheelrim pulls according to their values for each of the gear speeds, as is done in Fig. 4.

The plainest moral of the foregoing lies in the evident influence upon the gear proportions of the brake-horsepower curve. The motor designer must draw his inferences from these relations. From the presentation so far made the motor designer will be able to perceive offhand what range of the power curve in reality can be utilized in the driving of a car. It cannot be the object to design a motor so that it will produce power at a rate which continues to rise with increased number of revolutions. The important thing, on the contrary, so far as driving-results are concerned, is to get the maximum power development well within the limit of motor speed, the latter being first determined according to constructive and other requirements—in other words to get a hogback power curve. It can be secured by adjustment of the carbureter.

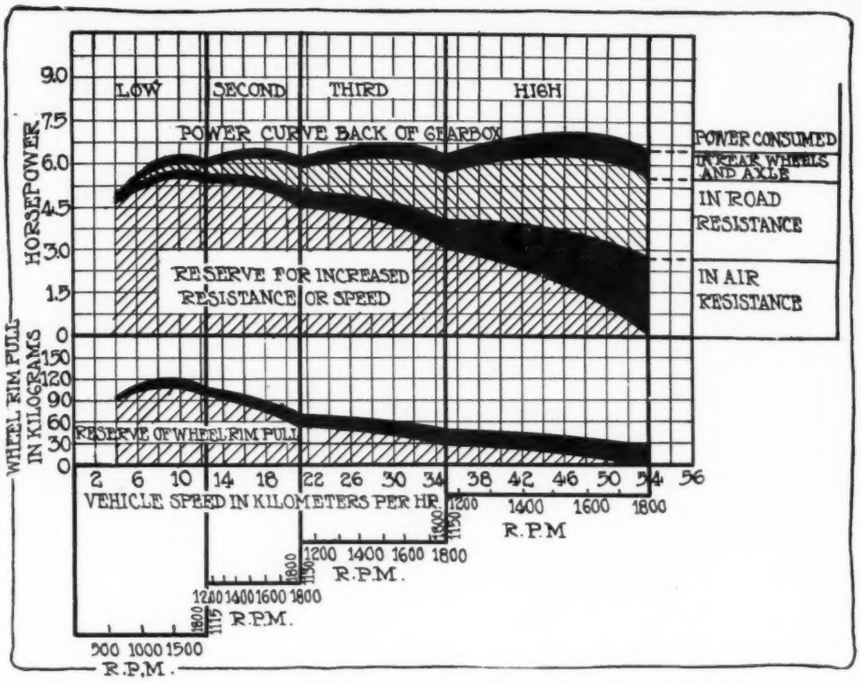


Fig. 6—Image of complete driving conditions with proper gear ratio

With regard to the influence upon the gear proportions of the efficiency curve of the vehicle as such, it is notable that it is only changes in the driving-resistances which are taken care of by a change of gear, and these depend only upon the movements of the vehicle. For this reason, to determine the gear proportions it is the power output at that point in the transmission system which must be considered where the power losses cease to depend upon the motor speed alone and where the resistances to be overcome begin to depend upon the vehicle speed alone. The point in question lies always back of the gearbox. The power curve to be used is therefore the brake-power curve minus resistances in gearbox.

In most cases it should be sufficient to assume a constant loss for all the gears. Minor variations occur, however, as between direct gear and the spurwheel transmissions, and such variations can be taken into account by choosing the proportion between two successive steps of the corresponding power curves to coincide with the proportion between the motor speeds at the upper limit of the lower gear and at the lower limit of the next higher gear, both of which give the same power. In this process certain rules may be adopted with regard to the limits of the efficient range. It can be established, for example, that the motor must not exceed a certain maximum speed. Then the curve for the first gear, by which the ratio is fixed, is determined by the identical power output required at the beginning of the next gear. On the other hand, it is also possible to start the curve from a different number of revolutions for each of the gears, with due consideration of the location of the maximum torque. In Fig. 5 there is given an example of this manner of laying out the gear proportions with allowance for the difference in the transmission efficiency for each of the gears.

All in all, the viewpoints presented for the selection of gear proportions seem to take all conditions of interest into definite account. A continuous image of the practical effects and the transportation movements resulting from the application of the method to a definite set of vehicle conditions has been constructed in Fig. 6, and may stand as an example of what may be done in other cases by introducing the values proper for each.—From *Auto-Technik*, April 11.

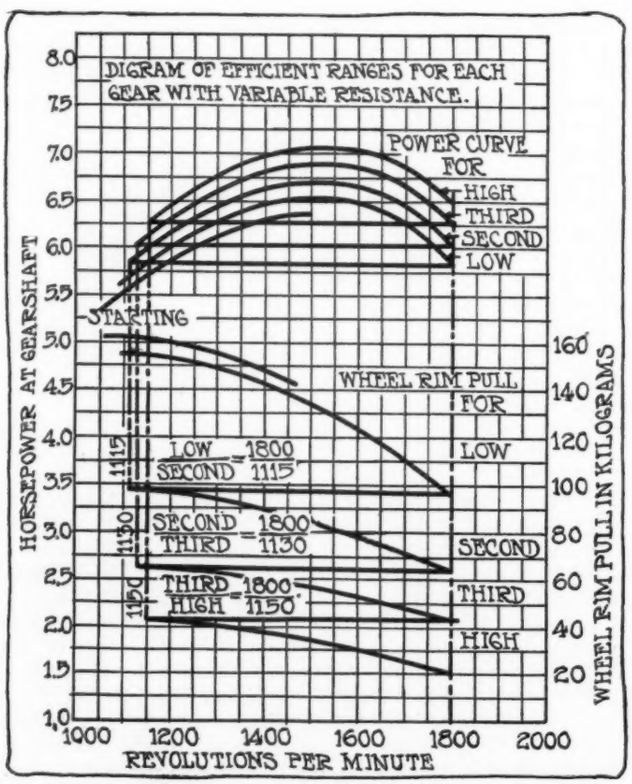
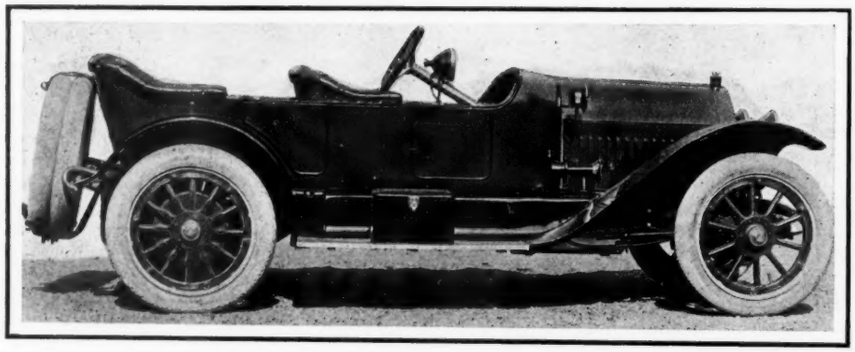


Fig. 5—Illustrating allowance for variations in transmission efficiency

Small Four Runabout Is Newest Stutz



Stutz bull dog, a four-passenger body on the large four chassis

Also Light Four-Passenger Body on Larger Four Chassis —Small Four Has Block Motor

TWO new cars have been added to the Stutz line, one an entirely new model with a different design of motor mounted on a smaller chassis than any yet put out by the Stutz company. The other is a four-passenger speed body, placed on the same chassis that has heretofore been fitted with the Bearcat and roadster bodies.

The new small four is entirely typical of its manufacturer in every particular save for the L-head motor which marks the first departure of the Indianapolis concern from T-head practice. Another departure is that the cylinders are cast in block, whereas in all former Stutz cars the four cylinders were cast in pairs.

New Torque Tube Support

The use of block cylinders has enabled the designers to considerably shorten the chassis, cutting the wheelbase down to 108 inches, whereas the Stutz Bearcat is 120 incnes.

Another change that has been made to accommodate the shortness of the chassis is in the connection of the forked yoke of the forward end of the torque tube. Instead of having this connection made to a cross frame member a face plate has been bolted over the rear end of the clutch housing and the connection of the torque yoke made to that.

In all other particulars the features that have characterized Stutz design in the past have been maintained. The clutch is a cone, power transmission is through a three-speed gearbox, the rear system is a Stutz, the front axle Timken and the drive and control are on the right. The selling price of this new four, which is known as the H. C. S., is $1,475

It is built only as a speedster and although not fitted with a top or windshield it is ironed for the former and can be fitted with the latter if desired. Speedometer and Hartford shock absorbers are mounted on this car as regular equipment as on all models. The completeness of equipment is a feature.

The other new Stutz is known as the Bulldog. It is also a speed model and is mounted on the same chassis as the Bearcat. In fact, it is the same as the Bearcat in every particular except that the body is a four-passenger one and while the Bearcat is supplied in both four and six cylinders the new model only comes as a four. The price is $2,250.

Being a speed model, neither top nor windshield is fitted to the Bulldog. The body is low-hung with high flush sides allowing the passengers to sit low.

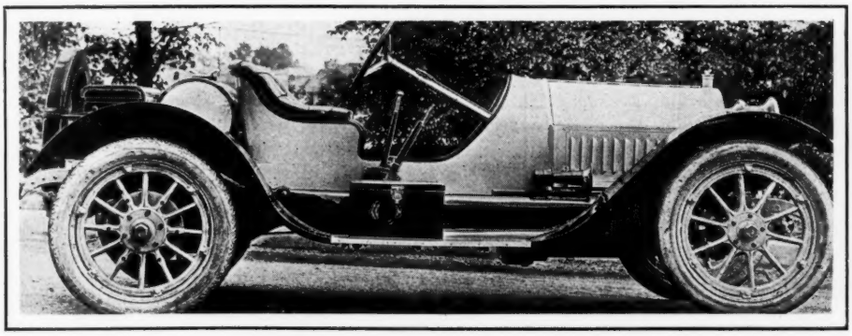
With the addition of the two new models the line has been brought to a point where the purchaser has a choice of ten cars.

On the 130-inch chassis there is a six-passenger touring and a six-passenger sedan. Outside of the choice of two bodies on this chassis the purchaser has his choice of a six- or four-cylinder motor. The two motors are interchangeable the bolt holes for anchoring the four-cylinder motor to the chassis are in the same positions as those which hold the six. This choice of two motors and two bodies gives a selection of four cars of 130-inch wheelbase.

On the 120-inch chassis the purchaser has a range of five cars. In the Bearcat model, which has been one of the Stutz leaders for the past 2 years, the same option of four or six cylinders is offered as on the larger chassis. The motors are also interchangeable and the parts throughout are designed to take care of the needs of the six-cylinder motor. When the four-cylinder motor is fitted there is no great difference in power as the difference in cylinders is made up by the larger bore and stroke of the four. The roadster is also made in fours and sixes and the Bulldog only in fours.

The tenth model is the last to be introduced to the line and, in fact, the Stutz company has only just commenced to ship them to its dealers. This is the H. C. S. It is intended for that class of purchaser who desires a speedy roadster of light weight. The prices of the ten models are as follows:

Model	Wheelbase	Cylinders	Price
Touring	130	Six	$2,400
Sedan	130	Six	3,800
Touring	130	Four	2,275
Sedan	130	Four	3,675
Bulldog	120	Four	2,250
Roadster	120	Six	2,125
Roadster	120	Four	2,000
Bearcat	120	Six	2,125
Bearcat	120	Four	2,000
H. C. S.	108	Four	1,475



Small Stutz roadster selling for $1,475

Like all the other Stutz cars the small four is equipped with a Wisconsin motor. In this instance a block-cast, power-plant with L-head cylinders marks a change from the former cars bearing this name. The valves are on the left and are covered by two removable cover plates held in place by knob screws.

Integral Intake Manifold

The new engine differs from previous motors used by the Stutz company in that it is a high-speed type of fairly high stroke-bore ratio. The bore is 3.75 and the stroke 5 inches, giving a stroke-bore ratio of 1.33. The casting is exceptionally compact including the water intake manifold and the inlet as a unit. The gases before entering the cylinder are preheated in this manner, both by the water from the radiator and by the heat radiated through the walls of the casting. The exhaust manifold is cast separately.

The cooling system is thermo-syphon, whereas on all the other Stutz cars the water is pump-circulated. On the H. C. S. engine the water outlet manifold rises through a bolted-on header from the cylinders and the waterjackets are large to give the free-flow demanded by this system of cooling.

Oiling is force feed with the oil pumped from the reservoir in the base of the engine to the three main bearings and through the hollow crankshaft directly to each of the crank bearings. It is then thrown off into the cylinders in the form of a spray that maintains a supply of lubricant in the motor.

Ignition and Lighting in One

It is in the electric equipment of the car that another noticeable change has been made. Instead of the combined starting and lighting unit with a magneto for ignition, the two-unit idea has been kept and a combined unit used for lighting and ignition with a separate starting motor. The starting and lighting equipment is manufactured by the Remy company as in the past. The lighting-ignition generator is mounted on the left side of the motor and the cranking motor at the rear right meshing with a gear on the flywheel only when needed to start the engine. The cranking motor is a simple series design capable of spinning the engine under normal conditions at 100 revolutions per minute.

As the H. C. S. is only made in the speedster design with a large cylindrical gasoline tank mounted behind the seat, the gravity system of gasoline feed is employed. The carbureter is the Stromberg G. 1-inch size. It is fitted with hot-air intake.

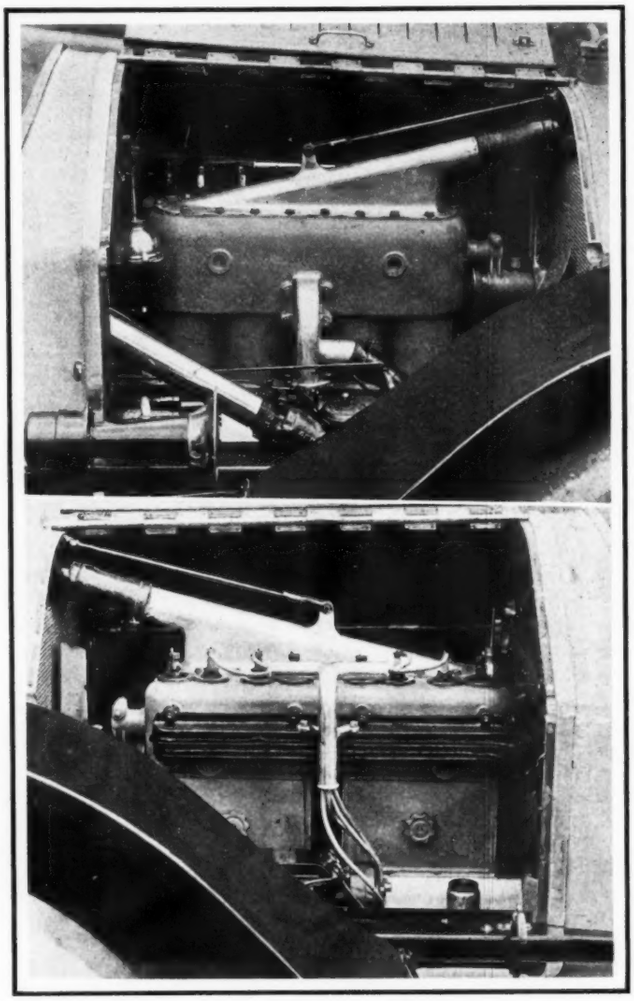
A leather-faced cone clutch with spring inserts beneath the leather is employed. The clutch pedal, as well as that for the brake, has an adjustment feature by means of which the length is adjustable. The entire variation in the length of the pedals totals 2.5 inches. Behind the clutch housing is bolted the face plate which takes the forked end of the torque tube as previously mentioned.

Gearbox on Rear Axle

The rear system employed in this car is the same as that which has formed a part of Stutz cars ever since they were introduced. The three-speed gearset is mounted just forward of the differential housing parallel to the torsion tube which incloses the drive shaft. While the forward end of the drive shaft runs on roller bearings, F. & S. annular ball bearings are used throughout the gearbox and on the outer ends of the axle shafts. The inner ends of the axle shafts are fitted with roller bearings of the tapered variety capable of taking the end thrust as well as the load.

The steering gear used in the H. C. S. is a Gemmer and in this particular the new car is similar to the older ones. Following Stutz practice the steering gear is mounted on the right and the control of the car is also on the right.

The brakes are double internal expanding operating on a drum bolted to the rear wheels. The wheels carry 32 by 4-inch tires. They are wood on the stock cars. The springs are semi-elliptic.



Upper—Right side of new small Stutz roadster known as the H. C. S. Lower—Left side of motor

The body resembles the Bearcat very closely. It is built along racing lines but instead of having the seat directly on the frame as in the Bearcat it is raised slightly above and there is a small sill which is a continuation of the downward sweep of the deep cowl. Although the body is ironed for a top none is fitted as the idea of the car is not to be used for a touring design but as a speedy raceabout. If desired, however, both a top and windshield could be fitted. The gasoline tank is carried on the rear deck and a trunk is fitted behind that. The spare tire is carried on the rear.

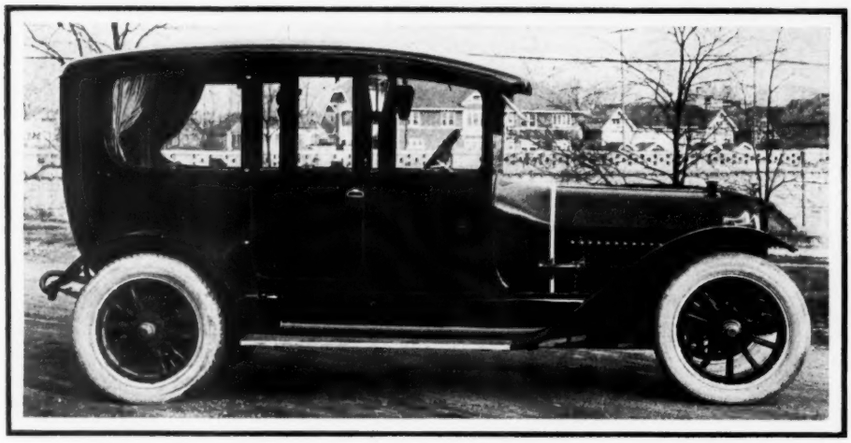
The 4.75 by 5.5-Inch Motor

The four-cylinder motor for the cars mounted on the 120 and 130-inch chassis is a T-head design with the cylinders in pairs and measuring 4.75 by 5.5 inches. The maker claims a horsepower of over 60 on the block at 1,500 revolutions per minute. The cylinders are offset .75 inch.

The crankshaft, .40 per cent. carbon steel, is carried on three main bearings. The push rods are roller type and the entire valve action is inclosed by an aluminum housing which is split in the center.

4 by 5-Inch Six Motor

The six-cylinder motor for the 120 and 130-inch wheelbase cars is of the same general construction as the four-cylinder except that it has a smaller bore and stroke, being a 4 by 5.



Stutz six-passenger sedan mounted on either a four or six chassis

The six-cylinder motor is also a T head and has the cylinders cast in threes. It has all the main features of the four, such as hollow crankshaft, force-feed oiling, large valves, and four-bolt connecting rods. The valves are inclosed by aluminum plates in the same manner as in the four-cylinder engines, except that instead of being held by a spring, the cover plate is removable by unscrewing a thumb nut.

The crankcases of both the four and six-cylinder motor are aluminum castings with the upper half supporting the main bearings by webs cast integrally and the lower half acting as a cover for the working parts and carrying the oil reservoir which in the case of the four has a capacity of 7 quarts.

Magneto Ignition Used

The lighting, starting and ignition equipment on the four and six-cylinder motors is similar. Ignition is accomplished on all fours except the H. C. S. by Bosch high-tension, double-type Z R magnetos, and on all the six-cylinder cars by Eisemann dual. This marks a change, however, from previous practice as some of these cars were furnished with low-tension magneto ignition.

The starting and lighting systems employed on the entire line except the new H. C. S. model as described, are the Remy motor-generator type. In these instruments the winding is such that below a certain speed the action is that of an electric motor while above that speed they act as a generator. On the average they start charging the storage battery at a car speed of about 15 miles per hour.

The clutch, gearbox and rear axle used on all these cars is the same in all essential details as that described for the H. C. S. model, the horsepower capacity of the transmission units being increased to take care of the greater strains imposed by the heavier and more powerful cars.

The tire sizes of all the cars on the 120-inch wheelbase cars are 34 by 4. On the 130-inch cars they are 34 by 4 for the touring in both four and six cylinders and 34 by 5 for the sedan. Wire wheels are furnished on these models at an extra cost of $100.

A wide choice of body colors is offered. The new H. C. S. comes in monitor gray, azure blue and Mercedes red; the Bearcat in gray, Mercedes red, vermilion and yellow; the roadster the same as the Bearcat; the new Bulldog, battleship gray with red upholstery. Azure blue with black or Mercedes red with red; the touring, ultramarine blue and maroon, and the sedan, ultramarine blue with Brewster green.

Model H. C. S.

Crankshaft diameter	1.75	inch
Rear crankshaft bearing length	4	"
Front and center bearing length	3	"
Big end bearing length	2.25	"
Piston pin diameter	1 3-16	"
Valve diameter	1 11-16	"

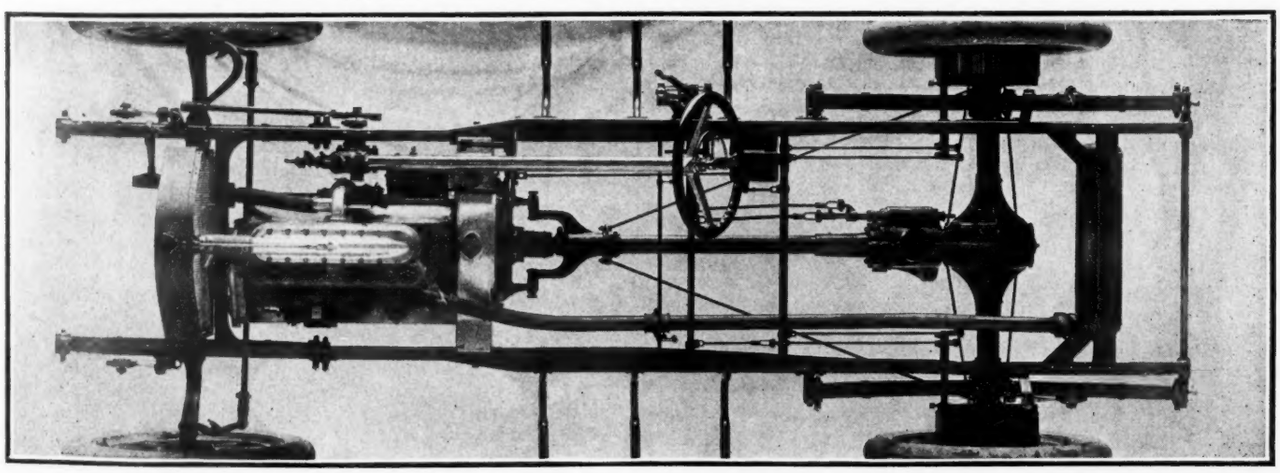
Prizes for N. Y. Automobile Parade

NEW YORK CITY, Sept. 27—The New York Commercial Tercentenary Commission has appropriated a fund of $10,000 for the automobile pageant to be run in connection with celebration on the evening of October 28. Of this amount, $5,000 will be in the form of awards, trophies and medals for decorated cars in the various divisions of the pageant.

William C. Poertner, who was recently asked to be chairman of the automobile committee, has retired in favor of J. E. Thompson. Merle L. Downs has been made secretary.

August Imports in N. Y. Port, 74 Cars

NEW YORK CITY, Sept. 28—The Custom House Statistical Bureau has published a detailed table of merchandise in bond on September 1, 1914, for the district of New York. This report states that seventy-four automobiles, valued at $146,610, were imported in the month of August, compared with seventy-eight automobiles, valued at $156,582, for the same period in 1913. Automobile parts imported were valued at $21,727 against $9,330 in 1913.



Plan view of small four-cylinder Stutz model H.C.S. The mechanism is divided into two units, the motor and clutch at the front and the gearset and differential at the rear

Smooth Exterior on New Eisemann

Single Magnets Used—Breaker Mechanisim Simple —Greater Factor of Safety—Hot Spark at Low Speeds

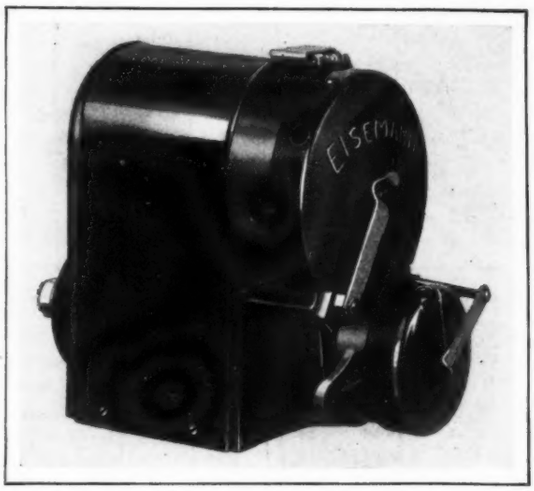


Fig. 1—Smooth and simple exterior of new Eisemann high-tension magneto

THE Eisemann Magneto Co., Bush Terminal, Brooklyn, N. Y., has placed on the market a new waterproof magneto which is styled type G and which differs in a number of respects from all other Eisemann magnetos. The new instrument is of the straight high-tension type, no provision being made for battery ignition. It is made for both four and six-cylinder motors of all sizes. It is chiefly remarkable for its extreme simplicity, the fewness of its parts and the intensity of the spark which is produced at exceptionally low armature speeds.

In appearance the new instrument is quite different from its predecessors. It is exceptionally smooth and compact. The magnets are covered by a sheet steel housing which is pressed into place in such a way that the joints are perfectly tight. The distributer housing is smooth, the terminal connections being inside. In fact the whole instrument is infinitely simpler in both construction and appearance than the older types of Eisemann magnetos.

Single Magnets Used

In construction the magnets are essentially the same as have been used in the past. Due to a more efficient winding of the armature, however, it has been found unnecessary to use double magnets. The distinctive Eisemann pole piece construction is retained. It is largely due to this that a strong, hot spark is obtained at very low speeds. The pole pieces themselves are in the form of wedges with their thickest parts at the center of the armature, as is shown by the accompanying illustration; consequently the armature is at no time isolated entirely from the pole pieces.

Magnetism Concentrated.

This construction causes the magnetic lines of force to be drawn from the extremities of the pole pieces toward the center of the core which results in the entire volume of the magnetic lines of force passing through the winding without being diffused. In addition this makes possible a somewhat wider range in timing the spark. Furthermore the armature acts as a keeper for the magnets and thus prevents their demagnetization.

Although the armature winding in the new instrument is practically unchanged, long experiment coupled with experience has produced a more efficient proportion between the secondary and the primary. At the same time the current collecting slip ring has been shifted to the end opposite to the end it occupies in other Eisemann instruments. This change has resulted in bringing all of the vital parts of the instrument to one end where they are all readily accessible by the simple expedient of removing the distributer housing and the breaker box.

Larger Safety Factor

In designing the new armature a much greater factor of safety has been allowed for. Instead of being placed between two closely spaced insulating rings, the slip ring R, Fig. 2, has considerable space between it and the insulating material at either side. At the gear end this insulating ring M is very thick and in order to obviate the possibility of the spark jumping to the gear in the case of a disconnected high-tension lead the insulating ring is deeply corrugated; thus its thickness is proof against the possibility of the spark piercing through and the corrugations prevent the spark jumping across the top.

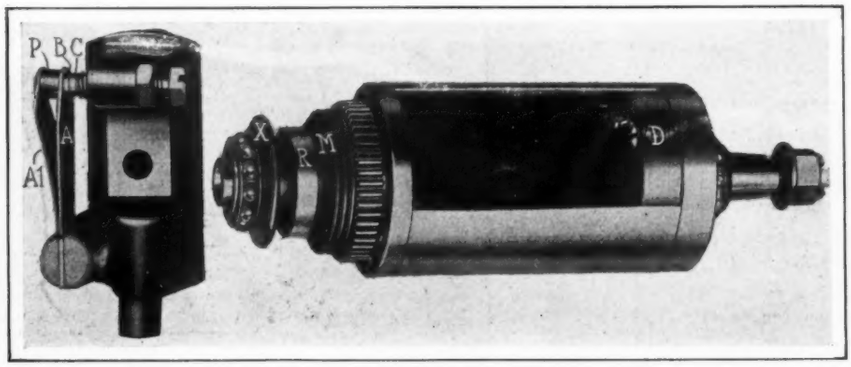


Fig. 2—Left—Detail of breaker mechanism. Right—Armature showing slip ring R and insulating rings M and X

The insulating ring X at the opposite side of the slip ring is similar in form to that ordinarily used but is slightly thicker and there is considerable space between it and the ring. The slight change in wiring has permitted the use of a smaller and more compact condenser which is housed in such a way that injury, except by direct intent, is practically impossible; otherwise the armature is standard, the core being built up of T-shaped castings pressed together with a quantity of laminations directly in the center where the magnetic influence is strongest. After winding, the armatures are shellacked and placed in an

oven at 180 degrees Fahrenheit. This process is repeated three times, after which the winding is considered to have had the last vestige of moisture removed and to be impervious to water or oil.

The circuit breaker, Figs. 2 and 5, is entirely new. Instead of being a comparatively heavy arm, there is a very light spring A which carries one of the platinum contacts B and which rotates with the armature shaft; the other contact C is mounted in the part which supports the spring.

The auxiliary spring A1 is merely for the purpose of slightly increasing the pressure between the contact points; it is separated from the main spring by a fibre plug P in order to eliminate the possibility of trouble resulting from static conditions.

Made integral with the breaker box there is a small cylinder D with two fibre inserts E and a third felt insert F, the latter serving merely for lubricating purposes. As the breaker mechanism rotates with the armature, the spring A wipes alternately against the fibre inserts D and E, thus making and breaking the primary circuit. The simplicity of this mechanism is only one of its noteworthy features. As there are no bearings, it is impossible for wear to cause irregular firing and as there is nothing to stick, possibility of trouble on this account is positively eliminated. Another very valuable feature is that owing to the exceptional lightness of the parts there is no battering of contacts which, consequently, may be expected to wear a correspondingly longer time.

New Distributer

The distributer has come in for complete revision. As already has been noted, there are no connections outside. The high-tension leads enter tapered holes in the top of the distributer block, the stripped ends being wrapped around large threaded studs. Over the wire is placed a washer W, which is tabbed to prevent it from turning when the nut N is screwed down. Before the leads are attached they are forced into their respective holes and as they are a tight fit it is impossible for moisture to enter.

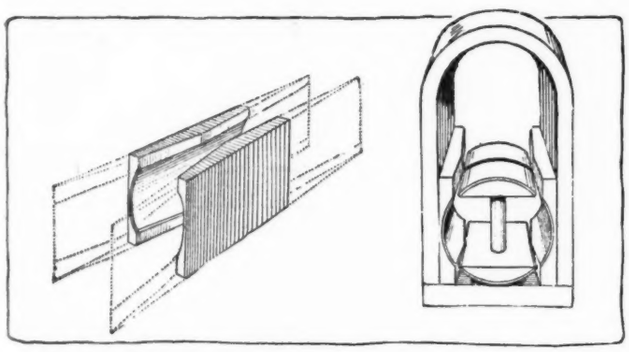


Fig. 3—Tapering pole pieces used to concentrate the lines of force

Fig. 4—Adjusting the breaker gap. A special wrench is furnished for this purpose

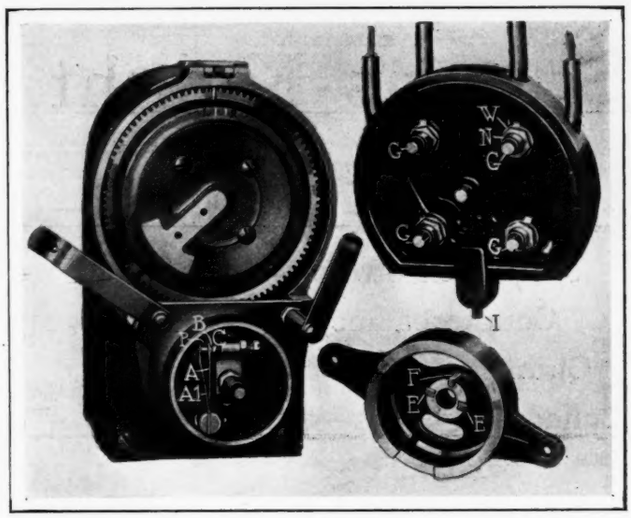


Fig. 5—Details of distributer and breaker construction

The high-tension distributer contacts G as well as the ground connection H are carbon—light springs being used to insure perfect contact with the distributer arm.

The distributer arm is inserted in the disk with which it rotates touching in turn the high-tension lead contacts. The location of the current collecting slip ring in its present position has made possible the elimination of a large number of parts heretofore necessary. The current collecting brush I is mounted in the distributer block and is removed with it, exposing the slip ring when the block is taken off. This makes it unnecessary that the current be led from one end of the magneto to the other as has been the case in the past.

Another excellent feature of the new instrument is that installation and timing have been simplified to the greatest possible degree. On the distributer gear there are two marks, one for left hand engines and one for right hand engines. In timing the magneto it is merely necessary to place one piston in firing position and turn the distributer gear until one of the marks, depending upon the direction of the rotation of the crankshaft, is in line with a screw in the distributer covering.

Electrics to Set New Mileage Records

NEW YORK CITY, Sept. 28—For the purpose of demonstrating the possibilities of the modern electric vehicle, both of the pleasure car and motor truck types, the New York Electric Vehicle Association has perfected plans for the running of a series of mileage tests during the Electrical Exposition and Motor Show in New York, October 7th to 17th. These tests will be run on the board track, which is laid out each year on the third gallery of the Grand Central Palace, for the purpose of showing electric vehicles in action during the show.

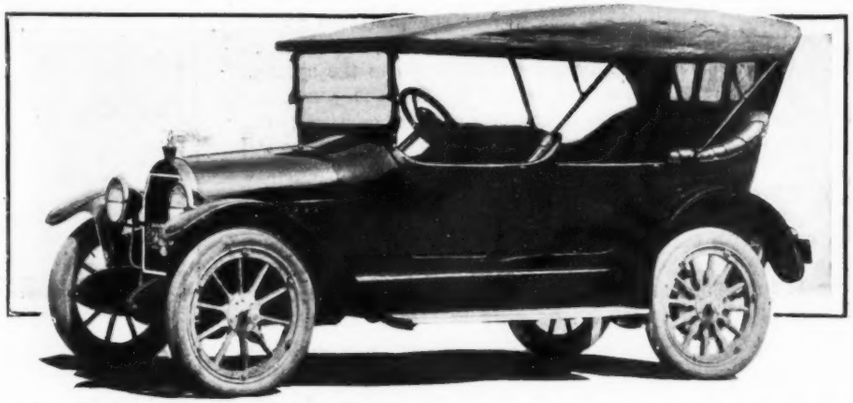
One of the tests will be for the greatest mileage on a single charge of the battery. It is open to all types but will probably be contested by runabouts, with one or two possible entries of light delivery vehicles. The present record is said to be 244.7 miles, made on the streets of Cleveland, Ohio, in 1911. The road record is 176 miles made recently in a run from Boston to New York.

A second test provides for a continuous day and night run throughout the ten days of the Show. This is to be accomplished by having two batteries to be used alternately, or by giving one battery the required number of short "boosts." This test is for commercial vehicles, as the results achieved will be most profitable for this type. As yet there is no record for a test of this nature and the one established during the Show is certain to attract wide attention.

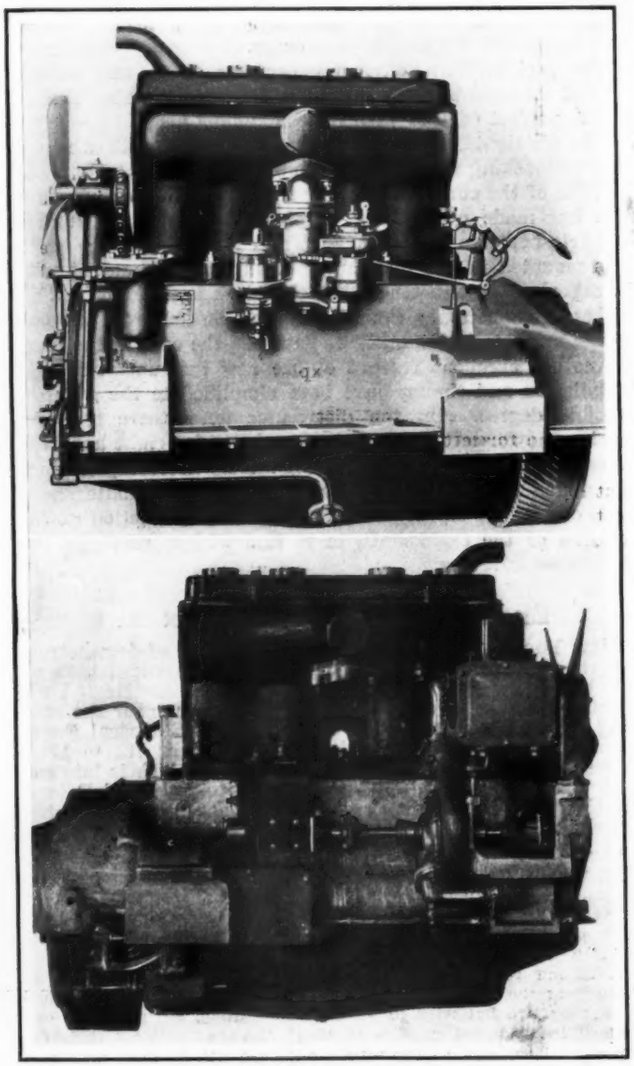
In addition, the New York Electric Vehicle Association is offering two handsome cups for road runs to be held during the Show, one for pleasure cars and one for motor trucks.

Stearns-Knight Four for $1,750

High-Speed Motor Has 3 3-4-Inch Bore and 5 5-8-Inch Stroke—Counterbalanced Crankshaft—Tubular Connecting-Rods—Gear-box Brake—Cantilever Springs



New four-cylinder Stearns-Knight five-passenger touring car which, with complete equipment, including electric starting and lighting, sells for $1,750



Upper—Intake side of new Stearns-Knight motor, showing integral intake manifold. Note automatic lubrication control interconnected with carbureter

Lower—Exhaust side of new Stearns motor, showing integral exhaust manifold and mounting of high-tension Bosch magneto and Gray & Davis system

A FOUR-CYLINDER, high-efficiency, high-speed Knight motor in a five-passenger touring car at $1,750 is a most important trade announcement in these days when the battle among six-cylinder, four-cylinder, and eight-cylinder is rapidly growing acute.

This is what the F. B. Stearns Co., Cleveland, O., is doing. The factory has already started production on 1,500 of these $1,750 cars for 1915. The first lot of 500 started through the factory in August, production is well under way today and demonstrators have already been shipped to dealers.

The new four-cylinder job with a motor 3 3-4 by 5 5-8, a wheelbase of 119 inches, 34 by 4-inch tires, weighing complete with all equipment 3,100 pounds, and having a rear axle gear ratio of 4 1-2 to 1, shows 45 miles per hour continuous speed on the brick roads around Cleveland, with a cabriolet body for two passengers. As a cabriolet, the price is $2,250, and as a limousine $2,850. All use the same wheelbase.

Many Features of European Design

To produce a Knight motor of the latest design for $1,750, as a five-passenger touring car, marks the début of a new era in Knight-motored vehicles in America. Heretofore they have sold much above this mark. But besides a lower price, the Stearns company incorporates in this new motor many other features found in the high-efficiency, high-speed, four-cylinder motor of Europe which are new in America. These include the counterbalanced crankshaft, counter weights being used to overcome bearing wear, caused by centrifugal force. The connecting-rods are hollow to give lighter weight, and on the lower ends are extensions for balancing purposes. An exceptionally light casting is used for the cylinder block, the wall thickness being only 5-32 inch. The aluminum crankcase is very rigid.

The new chassis introduces many other features new with Stearns such as integral intake and exhaust manifold, a single ignition system using a high-tension magneto, a service brake on the rear of the gearbox, cantilever rear springs, spiral bevels in the rear axle, pressed steel housing for the rear axle, gasoline tank in the cowl, and a reverse cone clutch.

A Real Factory-Made Car

A remarkable aspect of this new Stearns Knight is the fact that it is a factory-made car in every sense of the word, and not an assembled car. The Stearns factory produces nearly all of the parts. For example, the motor is made entire in the plant with the exception of magneto, starting and lighting units and silent chains. The company manufactures the

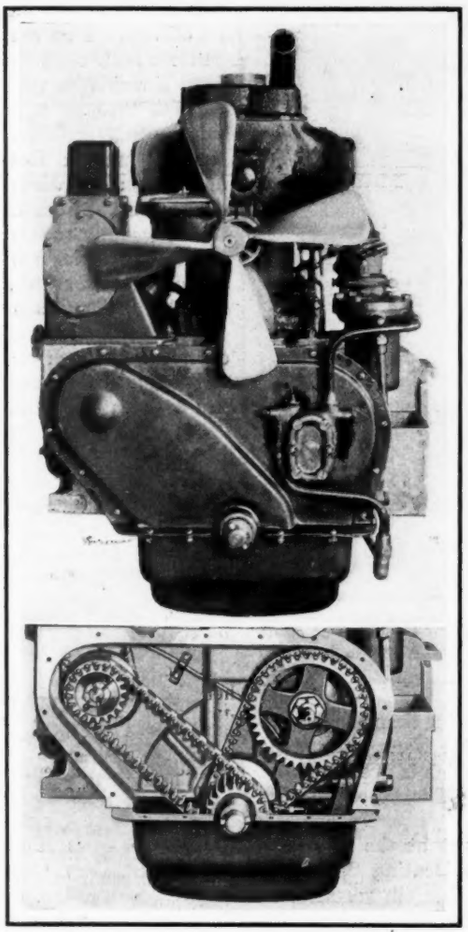
crankshaft, eccentric shaft, connecting-rods, pistons, and does all the work on the forgings and castings entering into the motor. The gears and shafts for the gearset are factory products. This category also includes rear axle, steering gear, front axle, etc. The Stearns company does not manufacture the forgings or castings entering into the car, but does all the work on the manufacture of these.

Many Stampings Used

Considerable use has been made of stampings because they are lighter in weight than forgings and castings which might be used in their place and they are cheaper to manufacture. Some of the stampings include, in addition to the base of the crankcase and the timing chain cover, brake drums, differential cover, rear axle and many smaller parts.

Rigid Crankcase

Considering the various chassis constructions and details, first comes the general design in which the motor, clutch and gearbox constitute a unit construction supported at four points on the frame, at the corners of the motor, and in which the heavy-section, aluminum casting forming the top of the crankcase also divides at the rear, leaving an opening for the flywheel and back of this carries the gearbox as a unit. This construction is one of the foundation stones in this motor design in that rigidity in the crankcase has been considered a necessity for efficiency in high-speed motor work in both foreign and American practice.



Upper—Front view of new Stearns-Knight four showing mounting of fan, carbureter and lighting generator. Lower—Interior view of timing gearcase on new Stearns-Knight

Light Weight an Aim

The block cylinder casting is a symmetrical design with its integral manifolds on opposite sides. The castings have uniform wall thickness throughout of 5-32-inch, which is in keeping with European practice. The base of the crankcase is a steel stamping and stampings are used as covers for the timing chains driving eccentric, magneto and pump shafts. This use of stampings is a part of the general engineering scheme of the car to reduce weight wherever possible and also to reduce construction cost.

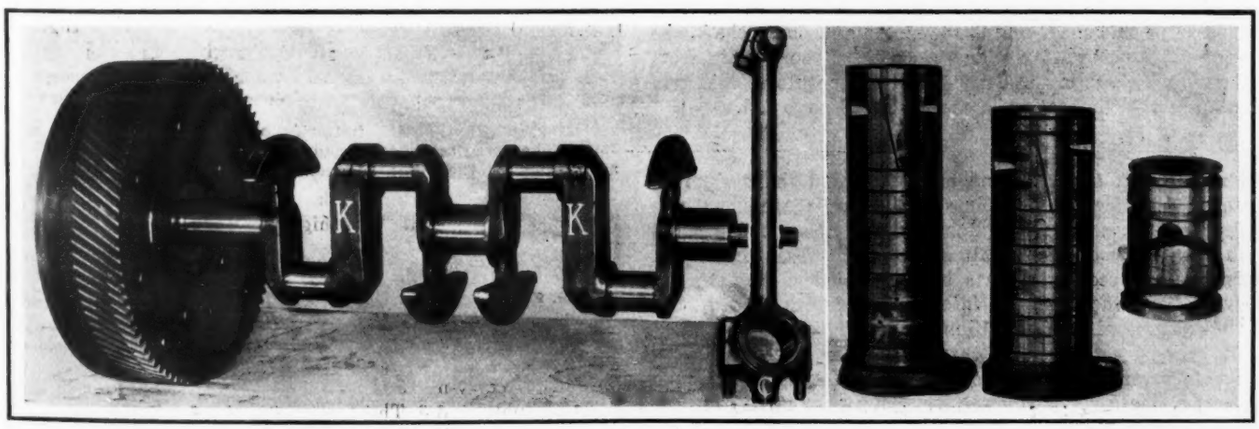
Counterbalanced Crankshaft

The most important feature of the counterbalanced crankshaft with its four integral crescent-shaped weights, is the two particularly heavy crank cheeks K used in order to give the required rigidity. All three of the main bearings are 2 1-2 inches in diameter and the lengths are, rear 4 1-2, center 2 3-4, front 2 3-8. The four crank pin bearings are 2 inches in diameter and are 2 3-8 inches long.

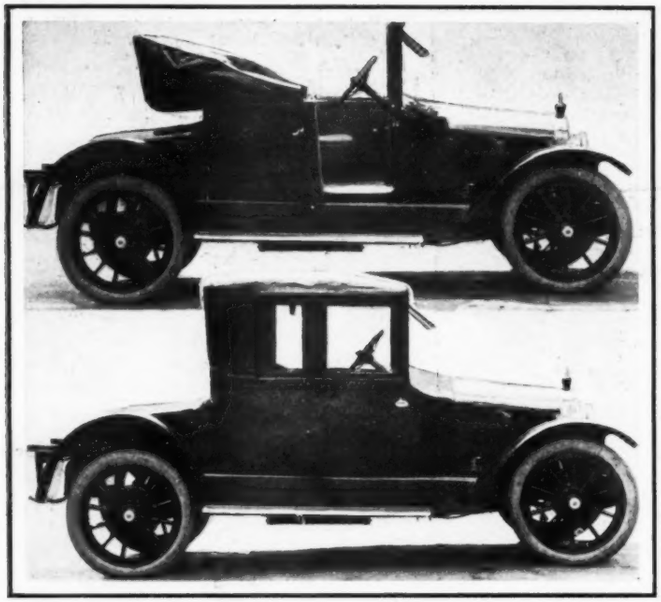
Stress Eliminated

The balance weights are used not to put the crankshafts in rotary or dynamic balance, for it is in rotary balance and also dynamic balance without these, but these are added to eliminate the stress on the bearings due to centrifugal force at speeds above 1,200 revolutions per minute. It has been found in high-speed motors that at continuous speeds above this point, the bearings wear, due to pressure not from the explosions and not from the actual weight of the crankshaft and other parts carried, but to irregular, centrifugal force on the shaft. This can be explained by the comparison of swinging a weight attached to a string around your finger. The faster you swing the weight the stronger is the tendency for it to fly away. With a single weight on a string the pull is always in the direction of the weight. If, however, we arranged two weights, one diametrically opposite the other, and then swung them in a circle, the centrifugal force of one would neutralize that of the other. This is what the counter-weights are used for. By neutralizing this centrifugal force inherent in the shafts without the weights, the wear on the bearings is eliminated.

Another factor is the tubular connecting-rod used for the



Left—Counterbalanced crankshaft used in new Stearns-Knight four-cylinder motor, showing the integral crescent-shaped weights, of which there are four. Two very heavy crank cheeks K are used for rigidity. Right—Cast iron pistons used in new Stearns-Knight four motor



Upper—New Stearns cabriolet with top folded. Lower—The same car with the top raised. This car sells for $2,250 and is mounted on the new Stearns-Knight four chassis

first time by Stearns. These rods are lighter than the I-beam type, an object desired in high-speed motor work, and on the connecting-rod cap is a short stub tube which is used to assist in getting better balance in the motor. The object of this extension is that the center of gravity of the entire connecting-rod mass at the lower end is brought at the center C, which is the center of the crankpin. By locating the center of gravity of this mass at the center of this pin vibration is eliminated which would be set up were the center of gravity at any other point than C. The hollow connecting-rods have a wall thickness 5-32 inch, and the hole is 5-8 inch.

Pistons are cast-iron ones with considerable length and slightly concave on top. The two rings are carried above the wristpin and the piston has considerable wearing surface between these rings which is used to prevent slapping and give a quieter motor. Each piston groove contains three rings, a broad inner one and two narrower ones outside of it.

As in all other Knight motor types, the two reciprocating sleeves are used, these being cast iron constructions with the usual annular grooves for lubrication and two sets of ports at the upper end of each sleeve, the ports on the one side for the exhaust and the opposite for the intake. These sleeves have a total reciprocation of 1 inch and are driven by short connecting-rods from an eccentric shaft. Morse non-adjustable chains drive this shaft and the magneto and pump shaft, the arrangement being triangular with a third short chain from the magneto shaft to the Gray & Davis generator. This may be seen in the illustration in the center of page 639.

Constant Lubrication

For the first time Stearns has eliminated the system of motor lubrication in which movable troughs are used, one under each connecting-rod. Instead is a non-splash system with varying pressure to all of the crankshaft, crankpin, wristpin, and eccentric shaft bearings, and a mist to the sleeves. The oil pressure is interconnected with the throttle, so that at normal speeds of 15 miles per hour the oil pressure is 20 pounds, yet when the throttle is open, there is an increase in pressure until 60 pounds is reached, at which point there is a safety valve which prevents a higher pressure. The prime object of this lies in the fact that a constant film of oil is desired in all of the bearings all the time.

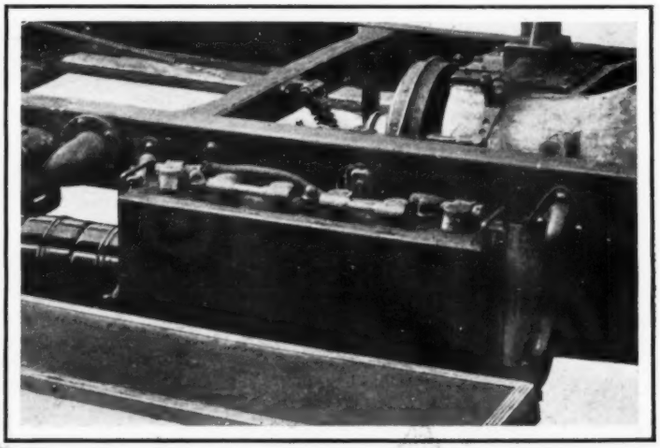
The oil system is conspicuous in that the parts are largely external: The gear pump is located externally at the front where it is driven direct from the eccentric shaft. It draws its oil through an external pipe from the crankcase base, and delivers it through another external pipe to a large cylindrical filter chamber on the left front of the motor. From this filter it flows through a 7-8-inch pipe incorporated in the crankcase and having branches to the three bearings of the crankshaft as well as to the forward end of the eccentric shaft and also to the water-pump shaft. The crankshaft is drilled so that oil is forced direct to the crankpins and lower ends of the connecting-rods, and thence through the hollow connecting-rods into the hollow wrist pin. The wristpin has brass end plates to prevent an excess flowing out against the sleeves and thus causing smoking.

Still another feature to prevent smoking due to too much oil rising through the connecting-rods and escaping through the wristpins, is that a small hole is drilled near the lower end of each connecting-rod.

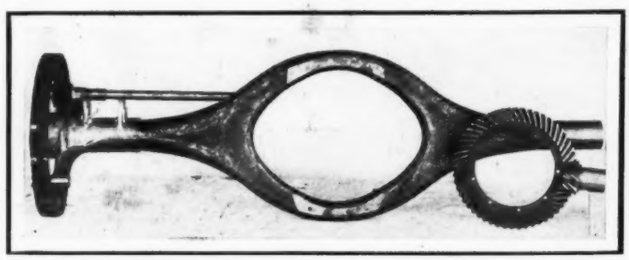
Three elements enter into the electrical system: First, the Bosch, single high-tension magneto gives an ignition system with one set of plugs and wiring reduced to the minimum. Starting and lighting are cared for by a Gray & Davis starting motor and a Gray & Davis generator. The starting motor, located under the right rear motor arm where its engaging pinion meshes with spiral teeth on the flywheel, is geared 30 to 1 to the crankshaft and is capable of spinning a cold motor 84 revolutions per minute.

The generator for the lighting system is mounted at the right front where it is driven by silent chain from the pump and magneto shaft. It has a ratio of 3 to 1 of the crankshaft and starts charging the battery at 12 miles per hour. The complete system is a 6-volt one with an 80 ampere-hour Willard battery in which the three cells are placed in line thereby giving a battery case that can be suspended on the right between the frame and the running board.

The clutch, incorporated in the flywheel, is a leather-faced one with springs operating under the facing. The reverse position of the cone, which moves backwards to engage in-



Neat disposition of the batteries on the Stearns-Knight new four. The three cells are placed in line, thereby permitting their suspension on the right between the frame and running board



Axle stamping used in new Stearns four for lightness and strength. The bevel gear and drive pinion are shown at the right

stead of forward, has been done solely to simplify the disengaging connection.

Three forward speeds and one reverse are afforded in the gearset, which is compactly housed in the extension of the casting forming the crankcase. There are end plates for carrying the bearings. Double-roll, annular ball bearings are used for the main shaft and Hyatt's for the countershaft, reverse shaft, and where the forward end of the main shaft is supported within the pinion from the shaft connecting with the clutch.

Power is conveyed from the gearbox through a propeller shaft having but a single universal joint which is at its forward end. Instead of conventional bevel gears in the rear axle, the spiral bevel is used, this giving a quieter drive.

The rear axle is a new design with Stearns in that the stationary portion is a diamond-shaped steel stamping of 7-32-inch stock, and having an opening into which the differential housing is secured. In external appearance the axle is not unlike the present steering axle, but is lighter, due to the stamping. The shafts can be withdrawn without dismantling the axle.

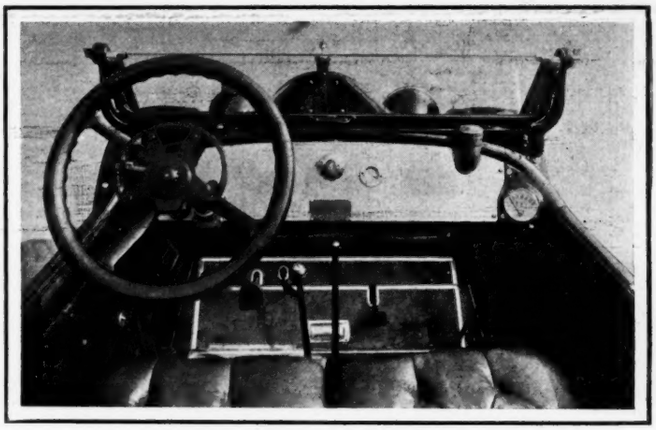
Brake Behind Gearbox

An innovation in the brake arrangements is placing the service brake on a drum immediately in the rear of the gearbox. This drum, measuring 10 1-2 by 2 inches, is so located as to be practically over the large rear bearing of the main shaft of the gearbox on which it is carried. The contracting bands faced with fiber are brought together by a wedged-shaped piece which is drawn forward by a horizontal rod passing through a tube in the gearbox and at its forward end couples direct with the pedal, giving a very direct pull. On this rod, at the rear of the wedge piece, is an adjusting nut, and to the rear attaches a spring which pulls it backward when the pedal is released. There is also a vertical spring which tends to separate the ends of the brake bands. The end of each brake band carries a small roller which bears on the inner face of each arm of the wedge.

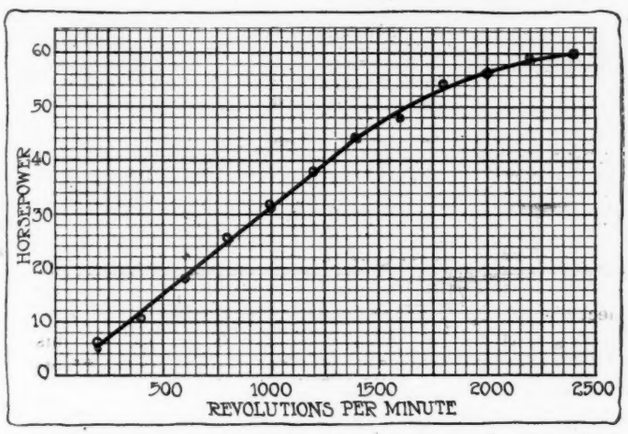
Emergency Brakes on Rear Wheels

The emergency brakes are expanding malleable iron shoes which bear on pressed steel drums attached to the rear wheels. These drums are 7-32-inch stock and measures 15 by 1 1-2 inches.

The cantilever spring is new and the springs are shackled at their forward ends, have a pivoted bearing support on the frame at the center, and at the rear fit to a bolt beneath the axle. The leaves are 2 1-2 inches wide and the spring measures 50 inches in length. The pivoted central support is not exactly in the center but positioned 23 inches from the front end and 27 from the rear. The drive of the rear axle to the car is through the long leaf of the spring rather than through



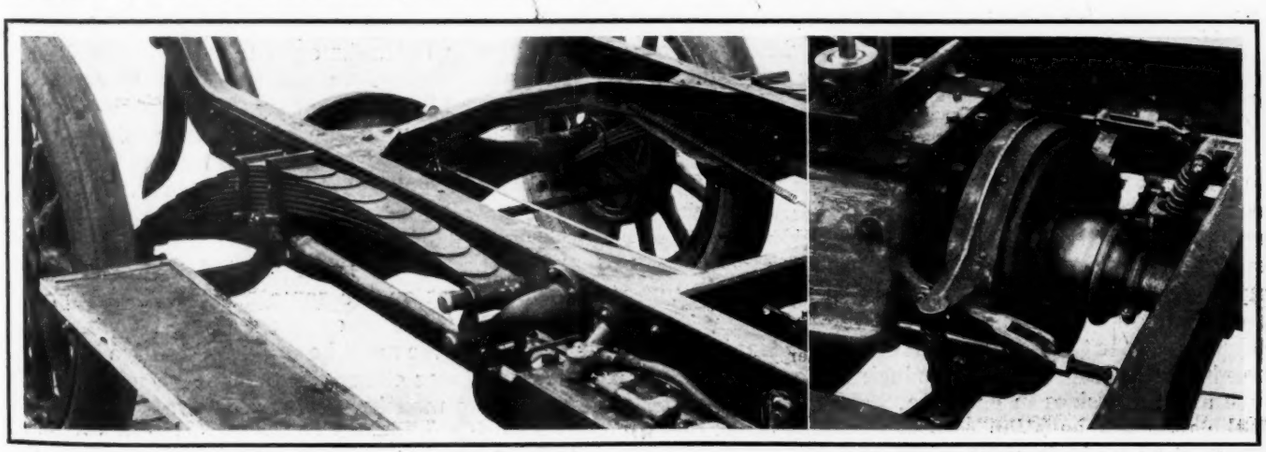
Dash and control features of new Stearns four touring car



Horsepower curve of new four-cylinder Stearns-Knight motor

radius rods. A pressed steel torque member parallels the propeller shaft and has the usual front end support.

The steering system has been developed to meet the requirements of a car selling at medium price. The steering gear is manufactured by Stearns as are the other parts of the system. On the wheel are the spark and throttle levers above the wheel and a center control button which, when pressed, pounds the electric horn, and, when turned, controls the lights. An ignition cut-out is provided above the wheel. Within the steering column, instead of there being the usual concentric tubes, one to carry the spark control, another the throttle control, etc., there is a series of four rods. One of these rods carries the spark control, another the throttle, and a third the switch and horn.



Left—Rear construction of new Stearns showing cantilever springs. Right—Gearbox brake which is a feature of the new car

The Automobile

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Too Many Tire Sizes

ENGLAND is having more trouble in the present war with too many different diameters and sections of solid rubber tires for trucks than with the mechanical defects of these trucks. There are not fewer than 120 different tire sizes at present in use on the British trucks doing service in the war zone. Carrying an adequate supply of spare tires is in itself a herculean task, but there is still the other task of the manufacturer, in that he has not on hand for ready distribution enough of the different sizes to meet the requirements.

Necessity always has been and still will continue to be, the mother of invention, and war has always been a great stimulator of ideas, and a force to bring about in relatively short time movements that it frequently requires years to accomplish. The British car maker as well as the British tire maker has been slow in the work of standardization, both have lagged behind the work America has done in this regard. The present war has demonstrated how imperative it is to have standardized parts, not only in cars but in equipment.

Last summer the Society of Automobile Engineers took hold of the problem of reducing the number of pneumatic tire sizes in America. The original draft of the plan of operation contained about eight different sizes and about six different diameters for over-size tires, making a total of fourteen or fifteen. The makers have agreed that better results could be had with fifteen different tire sizes than with the forty-seven different sizes that they manufacture at present. Cutting from forty-seven to fifteen sizes would mean economy to the tire maker, but it would mean greater economy to the tire users, by way of possibly cheaper tires, greater stock of all sizes in the different depots and perhaps a better adjustment of the tire to the load or weight of car, than is now had.

But our S. A. E. can go further, and, cutting a leaf from the book of experience in the present war, start vigorously on the work of cutting down the number of sizes of solid tires. The lesson that Great Britain is experiencing is one that should be quickly seized upon, the sooner the better. Fewer sizes of solid tires will mean much to the truck owner, who may find difficulty in getting a ready supply of tires in all parts of the country.

The Latin-American Sale

SANE business is one of the greatest requirements of today, when makers have found the doors of Europe closed to their passenger car business and it becomes necessary to develop fields in Latin America or other lands not directly affected by the present hostilities.

This is no period to stampede business in new fields. It is impossible. Rather this is a most opportune moment to begin the missionary work in the twenty or more Latin-American countries. These countries offer excellent fields for business but you need something more than a Spanish catalogue and a moving picture film of your factory to secure that business.

It is hard to do business with a man when his banker has failed him. Just at this moment South America's bankers have gone back on it, because those bankers are European countries at present at war. With conditions in South America such that a three-months' moratorium was the first necessity on declaration of war, how can the American maker expect to pursue his old policy of getting money for his automobile as soon as it is loaded on the ship in New York harbor; and yet some makers, who are at the present moment trying to enter the thin edge of the wedge in Latin-American business are today boasting that South America will have to come to their terms and buy cars on this pre-pay basis.

It is foolish to play the ostrich rôle of sticking your head in the sand and imagining you are safe, because you cannot see the other party. This is almost a parallel of what some of our American countries are doing.

Instead of this we must meet Latin American countries at least on the same basis that European countries met them when they started developing their business. We must be prepared to give credits, and not short ones either, but some that will extend as long as nine months, perhaps twelve. Credit accommodations are needed today in every one of the twenty Latin-American countries. We have to aid

in financing these lands before they can buy our merchandise.

Some automobile manufacturers have already announced that business cannot be done this way; that the automobile industry is different from all other industries; that although credit accommodations have been necessary in other mercantile lines yet such are impossible in the automobile industry. Perhaps with several companies it may be impossible at the present, but the situation remains, that we will have to meet Latin Americans more or less on their own methods of doing business.

Credits of sixty and ninety days have not been injurious to European trade in the past. The draft at this period covering the value of the goods, which the buyer in a Latin-American country must accept and endorse and which his banker holds until collection is due, has proved satisfactory in the past. Failure to meet such a draft is equivalent to action in bankruptcy. Europe has found this system satisfactory and America will, it is almost a certainty, have to meet the requirement of South American business in the same way.

The maker who wishes to entrench himself in South America should start now. He must start in a sane business-like manner, not with any whirlwind campaign, with cut prices and large press advertisements, but rather with a good stock of cars, with a better stock of parts, and with a force of mechanics who know the car, know how to drive it and how to take care of it. The salesman must establish confidence as the first requisite of business.

New York S. A. E. Discusses Tire Abuse

NEW YORK CITY, Sept. 24—Two interesting papers were presented at the S. A. E. meeting held at the Automobile Club of America tonight. This was the first Fall meeting of the Metropolitan Section. One of the subjects presented had to do with the causes and effects of tire abuse, illustrated with many lantern slides. It was presented by Mr. L. Greenwald, of the Firestone Tire & Rubber Co., Akron, O. The other paper dealt with tire fabrics and was given by H. Van R. Scheel, of the Brighton Mills.

In Mr. Greenwald's paper many points that affect tire economy were brought out. One slide showed the effect of applying the brakes too suddenly, causing the wheels to slide. The tread was roughened and torn so that its life was materially lessened. The same effect might be brought about by a clutch that did not engage smoothly or by careless use of the clutch in starting the car.

Several illustrations of worn and loosened treads caused by wheel irregularities were given. Wheels out of round, or out of alignment, loose demountable rims, bent axles or spindles, bent steering arms, etc., were mentioned as causes of the quick deterioration of the casings. The canting of the wheels was mentioned and it was stated that practice varied greatly in this particular. The maximum amount was 1 1-8 inches and the minimum 1-4. That is to say that the distance between the top and the bottom of the front wheels was this much greater at the top than at the bottom. With more than 1 1-8 inches the tendency was to tear the tread loose in a short time.

Another slide showed the tread of a racing tire that had been worn away in a short time due to the high speed alone. Such a tire can be made almost as good as new by retreading, because the fabric is still in good condition. The wearing away of a racing casing is due to both the tearing action that the tread is subjected to and also the heat which in many cases softens the rubber so that it loses its strength and melts away, so to speak.

Temperature in Touring 150 Degrees

The temperature in ordinary touring is not over 150 degrees Fahrenheit and sometimes not more than 130, while in racing it is not believed that the temperature goes above 200, unless the tires are underinflated. It is difficult to obtain relable data on this phase of the subject, because it is almost impossible to determine the temperature with accuracy.

Damage due to running in car tracks takes the form of cuts in the sides of the tread and there is a likelihood that the fabric is broken also. A small amount of driving in car tracks will not hurt the tires appreciably, but the continued practice of this will result in the trouble described. After the tread becomes cut, moisture and dirt enter and in time loosen the tread from the fabric. Meanwhile, any broken places in the tread are becoming worse, so that a premature blowout due either to rotted fabric or a weakened tread results.

Underinflation not only produces cracks in the sidewalls of the casing but it also has a tendency to loosen up the top of the tread by wave effects set up in it. Furthermore the beads of the tire are weakened by the extra strain.

Fifteen to 18 pounds per inch of tire section in the front and 15 to 20 pounds in the rear is the correct amount.

Reliners are advisable only when used in old shoes, and then only when properly manufactured and of good material.

Many examples of careless application of tires and tubes were given. One slide showed the effect of putting the flap of the tire next to the tread with the result that the tube was chafed and punctured. Another showed where a straight sided tire had been put on a clincher rim without filler rings, the result being that the walls of the shoe were broken. A similar example was one in which a clincher tire was placed on a wheel with reversible rings, but the mistake was made of only reversing one ring. The result was that the side walls gave out.

Too much lubricant was shown to be just as serious as too little. A lump of soapstone will cause chafing and heating and a puncture may result. On the other hand, too little lubricant causes the tube to stick to the casing and permanent stretching of the tube results. This effect is due to the fact that when the tube sticks to the casing the continual working of the latter takes the elasticity out of the former and it takes a permanent set. The set of the tube is due to the heat developed.

Graphite Good but Dirty

Flake graphite is undoubtedly the best lubricant, but it is objectionable because it is so dirty. For this reason mica or soapstone are generally used. The lubricant should be rubbed well into both shoe and tube.

Pinched tubes are caused by a portion of the tube becoming caught under the shoe or else the tube becomes doubled back on itself with the result that it chafes and blows out.

When it is found that the tires wear on the side walls due to ruts, they should be rebuilt before the fabric is injured, and if it happens that the wall on only one side is worn away additional life may be obtained by reversing the shoe.

Driving a tire flat causes chafing of the walls, strains the bead, and bends the tube double and cuts it. The amount of the injury depends in a large measure, however, on the care with which the driving is done.

Oil on garage floors softens the rubber and loosens the fabric.

Overloading is much the same as underinflation, it causes the breaking down of the side walls.

Loosening of the tread is generally due to the neglect of cuts. After a cut appears, moisture and sand enter and rot and wear away the fabric and the rubber until part or all of it is loosened. The remedy is simply to repair the cuts as they appear.

Following this the paper on tire fabrics was presented. Mr. Scheel of the Brighton Mills stated that Sea Island cotton was superior to all other materials for tires because it has greater flexing qualities, stands heat better and is believed to be somewhat self-lubricating, due to the slight amount of oil secreted in the fibres. He showed how the present fabrics were evolved and brought to their present state of excellence. In the beginning the fabrics were light and cut parallel to the threads, but experience showed that heavier material was required. It was also found that when the fabric is cut on the bias so that the threads make an angle of 45 degrees with the rim greater strength and wearing qualities were secured for the reason that the stresses are distributed more evenly over all the threads.

U. S. Appoints Seven Commercial Attaches

These Will Go To Foreign Countries To Open Markets for American Manufacturers

WASHINGTON, D. C., Sept. 26—Motor car manufacturers who are making a play for foreign trade will be interested to learn that the Department of Commerce has recently appointed seven commercial attachés, who will be sent to European, South American and Asiatic cities to carry out plans of the bureau of foreign and domestic commerce for aiding American manufacturers to broaden their foreign markets.

The appointments are: C. W. A. Veditz, Philadelphia, to Paris; Prof. Lincoln Hutchison, University of California, to Rio de Janeiro; Irvin W. Thompson, North Carolina, to Berlin; Dr. Albert Hale, Indiana, to Buenos Aires; A. H. Baldwin, former chief bureau of foreign and domestic commerce, Washington, to London; A. I. Harrington, Ohio, to Lima, Peru; Julian H. Arnold, consul general at Hongkong, to act for China.

No time for the departure of the new appointees to their posts has been made, owing to the troubled situation abroad. The early departure of the South American attachés is planned, but the opening of the offices in London, Paris and Berlin will be delayed for a time.

—

S. A. E. Annual Meeting at Show Time

NEW YORK CITY, Sept. 30—The 1915 annual meeting of the Society of Automobile Engineers will be held in this city early in January during the time of the automobile show.

The divisions of the Standards Committee are now resuming active work. The next convention of the Standards Committee will be held during November, the sessions of the meeting probably extending over 3 days, upon which reports of divisions will be submitted and considered.

The Ball and Roller Bearings Division still has under consideration the matter of recommending a list of stock of sizes of roller bearings, eliminating many of the sizes now listed by manufacturers.

The Carbureter Fittings Division is making a close study with a view to determining whether it is feasible or advisable to recommend standards in addition to the present S. A. E. standard carbureter flange dimensions, to cover the application of side-outlet carbureters. The problem in question is radically different from anything the Carbureter Fittings Division has so far attempted in the way of standardization.

In response to the very few complaints that have been received, the makers of wood wheels for trucks have been asked to present their views on the thickness of S. A. E. felloe bands, and will probably attend the meeting at which the subject will be taken up by the Commercial Car Wheels Division.

The Iron and Steel Division has under consideration, modification and extension of steel castings specifications.

A report from the Lock Washers Division is expected on the question of whether the smaller sizes of the S. A. E. standard light series are too light.

The Miscellaneous Division will endeavor to establish a standard of speedometer drive-shaft ends at an early date. It has also been furnished by the authorities of practically all of the States of the Union with data as to the elements of license pads that govern the size and location of attaching devices.

It is expected the Clincher Automobile Tire Manufacturers' Association will at an early date act upon the matter of establishing a new rim size for the 36 by 5-inch tire.

W. A. Frederick, as chairman; W. R. Strickland and W. F. Herst were appointed a sub-committee to consider bell housings standardization. It is the view of the Standards Exchange Division, after investigation that five sizes of bell housings can probably be concentrated upon.

A sub-committee to take up with the Automobile Engine Manufacturers' Association the matter of arriving at accepted practice as to motor supports was appointed as follows: A. F. Knoblock, chairman; C. B. Rose and W. A. Frederick. The above-mentioned sub-committees are charged with consideration of fly-wheel diameters, tailshaft details, etc., and all other matters connected with the interchangeability of units where engines and transmissions are involved.

The Seamless Tubes Division has been discontinued, Chairman H. W. Alden having recommended that this be done.

The schedule of meetings of the Metropolitan Section is based on the work of its Research Committees, six of which have been appointed to investigate various subjects. The proposed program is as follows:

October 29—Report of Research Committee on Electric Transmissions, David Beecroft, chairman.

November 24—Report of Research Committee on Engine Characteristics, Robert McA. Lloyd, chairman.

Supplementary subject: Eight-cylinder Motors.

(Date advanced to Tuesday on account of holiday.)

December 29—Report of Research Committee on Engine Governors, A. J. Slade, chairman.

Supplementary subject: Magneto versus Dynamo Ignition.

January 28—Report of Research Committee on Greases, H. M. Martin, chairman.

Supplementary subject: Asphalt vs. Paraffin-Base Lubricants.

February 25—Report of Research Committee on Kerosene Carbureters, A. B. Browne, chairman.

Report of Research Committee on Non-Electric Continuous-Torque Transmissions, L. M. Dieterich, chairman.

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Lozier Reorganization Is Probable

DETROIT, MICH., Sept. 30—*Special Telegram*—While the inventory started by the Detroit Trust Co., temporary receiver for the Lozier Motor Co., is not completed, conditions to date are satisfactory and will more than likely lead to reorganization shortly. At a directors' meeting, President Joseph M. Gilbert was authorized and directed to file an answer in the U. S. Court stating that the company was not insolvent 4 months prior to the filing of the petition by certain claimants who had claimed insolvency 6 months prior to filing of their petition.

DETROIT, MICH., Sept. 25—Judge Tuttle of the United States District Court, has named the Detroit Trust Co. temporary receiver for the property of the Lozier Motor Co., and officials of the trust company are now busy both in Detroit and in Plattsburg, N. Y., making an inventory of the company's property.

In the court Judge Tuttle suggested to all interested that an effort be made for a reorganization of this old and so well known automobile company, and it appears from what attorneys and creditors say that the effort at re-establishing the Lozier Co. upon a sound basis may succeed.

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What South America Needs Most

WASHINGTON, D. C., Sept. 29—**"What is needed at this hour in Latin America is not so much a supply of the manufactured products of the United States, although required in considerable quantities, but money, loans and advances, credits on purchases, and markets at reasonable rates for raw products which usually go to Europe."**

This sums up the South American situation as interpreted by the Pan-American Union which recently obtained cable reports from thirty-four different cities in South America and Central America on business conditions in twenty of these Latin-American countries.

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Champion and Jeffery-Dewitt Consolidate

TOLEDO, O., Sept. 25—The Champion Spark Plug Co., the largest manufacturer of spark plugs in the world, and the Jeffery-Dewitt Co., Detroit, one of the oldest spark plug manufacturing companies in the country, have consolidated and the business of the companies will be conducted from Toledo, from where the J-D and Reliance spark plugs, which have been made by the Detroit concern, will hereafter be marketed in addition to the Champion plugs.

The Jeffery-Dewitt Co. will be devoted from now on exclusively to the manufacture of porcelain and porcelain products.

Recently the Champion plant has been greatly enlarged through the addition of 40,000 square feet of floor space and the spark plug machinery and equipment of the Jeffery-Dewitt company will all be moved to this city. At present the Champion company has a daily output of 25,000 spark plugs, but this will be increased, probably by 5,000 to 10,000.

The Jeffery-Dewitt company, which has a capacity of more than 35,000,000 pieces of porcelain per year, is said to make better porcelain than the imported.

The Jeffery company was organized in 1907, having started in business in Newark, N. J., and employed at that time twenty-five to thirty men. At present its force is about 400 men.

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NEW YORK CITY, Sept. 29—A. B. Cordner, W. A. Allen and David Wills have formed the Motor Devices Co., to handle automobile accessories. They have incorporated for $30,000.

Ford Adds Coupelet—Sedan—Chassis, $410

Better Finish and Novelties in Design in New Body Models—Gills Make Hoods More Attractive

DETROIT, MICH., Sept. 29—This year the Ford company is going after the closed car business more strenuously than ever by offering a coupelet and sedan on the regular model T chassis. These are the best finished bodies the Ford company has ever put out and the prices are $750 for the coupelet and $975 for the sedan. The other closed car model, the town car, is continued at $690.

The appearance of these new Fords is very attractive and besides the new bodies, the hoods have been provided with gills which add a distinctive touch. This gill feature is not applied to the regular open models, which remain the same as they have been, for the time being at least.

The coupelet is of the regular convertible type which has become so popular. The top may be folded back to make substantially an open runabout of the car, while when the top is raised and the door windows in place, it is a completely closed-in affair similar to a coupé. The top is of genuine leather and the lines of the body such that it should make a strong appeal. The seat is broad and wide and has deep upholstery, while doors are roomy with the glass in a sliding sash and slipping down into the panel, protected by waterproof flapper. Triple hinges are fitted to the doors to assure alignment.

The windshield is of special design, being double ventilating, the top section swinging outward or inward, while the bottom section swings only outward. When closed both sections are rigid. The entrance to the rear of the body is by hinged tailboard, lifting from the bottom, providing room for a suitcase, inflated tire or other articles. The cowl connects the hood to the dash in graceful line.

The sedan makes a nice town car, and provides seating for five. The rear seat has room for three, while there are two individual seats in front. The right hand front seat is on a pivot and folds back out of the way when not in use. Upholstery is of cloth.

There are two wide doors which open to the front, have triple hinges as in the coupelet, while an attractive windshield is also fitted. This has three sections, two at the top and one at the bottom, the driver getting plenty of air in bad weather while still protected. As in the coupelet also, the cowl slopes to the hood. Curtains of roll type are fitted to the windows, and the glass in the doors may be dropped by means of straps. The glass has no sash or woodwork around it.

Deliveries on the coupelet will commence about October 1 and on the sedan about November 15.

The Ford company has also announced that it will henceforth furnish chassis without body for $410. These may be used either by fitting delivery or other commercial bodies or special bodies. Heretofore when a customer wished only a chassis, the dealer has been obliged to purchase either a runabout or a touring car and remove the stock body. This he has then been obliged to carry in stock until he found a call for it. The new arrangement should therefore be of special advantage to the dealer as well as to the buyer who wants to fit a special passenger body or use the car for commercial work.

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Many Makers Buy Bales of Cotton

NEW YORK CITY, Sept. 30—A movement has been set on foot, with the object of benefiting the cotton industry of the South, for all who can do so to buy a bale of cotton and hold it till the South recovers somewhat from the war depression. A number of our largest automobile manufacturers have taken part in this movement, buying large quantities of cotton themselves and instructing their agents to buy as well.

It is doubtful whether this movement will really be of benefit to the cotton industry, according to prominent bankers and cotton men of New York City, who define it as poor business and poor economics, and ask why we should not start similar movements to benefit the other industries of the country which are suffering depression due to the European war. These men also state that there is danger that people buying cotton at the present price will lose money on it.

Among the prominent automobile, accessory and supply manufacturers who are taking part in the movement are: Goodyear Tire & Rubber Co., Akron, O., Hudson Motor Car Co., Hupp Motor Car Co., Saxon Motor Car Co., Studebaker Corp., Detroit, Mich., Willys-Overland Co., Toledo, O., Partin Mfg. Co., Chicago, and Valentine & Co., New York City.

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Motor Print Absorbs Motor Life

NEW YORK CITY, Sept. 28—The Motor Print Co., Philadelphia, Pa., publisher of *Motor Print*, the well-known monthly motorists' paper, has purchased *Motor Life*, another popular monthly motoring paper published by J. A. Wittmann, New York. *Motor Life* will be merged into *Motor Print* under the name of *Motor Print*. *Motor Life* subscribers will, beginning with the November issue, receive *Motor Print* which will incorporate some of the departments of *Motor Life*.

The great similarity in the nature of the two magazines makes it possible to merge these two strong motor monthlies. The clientèle of both is found with the motor car user and the consumer in general. Their circulation is national, and broadly distributed from ocean to ocean.

The Philadelphia publication office of *Motor Print* at 418-420 Sansom street, will continue to be the publication office of *Motor Print* after *Motor Life* has been merged with it.

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COLUMBUS, O., Sept. 25—According to the announcement of the Ohio Agricultural Commission, automobile displays will play an important part in the first mid-Winter fair to be held at the Fair Grounds, Columbus, January 9 to 15.

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Denby Co. Announces New 1-Ton Truck

DETROIT, MICH., Sept. 24—In addition to its ¾-ton truck recently announced by the Denby Motor Truck Co., this company will also place on the market a 1-ton truck, identical in construction to the smaller one, the only difference being heavier springs and larger tires. The price will be $1,600, or $100 more than the 1,500-pound truck.

DETROIT, MICH., Sept. 29—C. T. Chenovert and Beckwith Havens, export and assistant export managers of the Denby Motor Truck Co., start today on a 2-years' demonstration trip around the world in a 1,500-pound Denby truck specially fitted for outdoor camping. From here the route leads to Vancouver via Chicago, Davenport, Omaha, Kansas City, Denver, Salt Lake City, Stockton, Los Angeles and the coast. From Vancouver the truck will be shipped to Honolulu, thence to New Zealand, Australia, Dutch East India, Asia, Japan. All of these countries will be given extensive demonstrations. Before starting for Europe all the South American countries will be visited.

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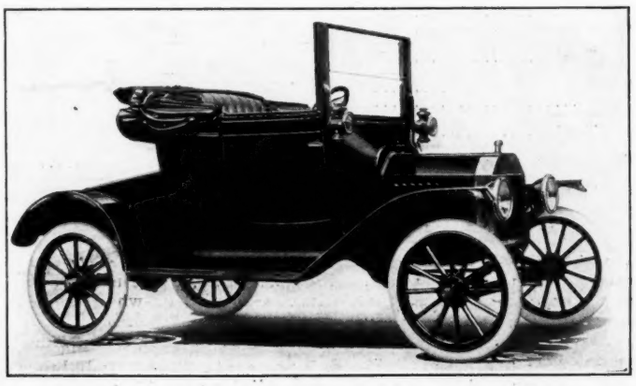
New Sale for Wisconsin Engine Co.

MILWAUKEE, WIS., Sept. 28—On petition of the Bosch Magneto Co. and the Titusville Forge Co., Judge F. A. Geiger of the Federal Court at Milwaukee has ordered the sale of the property of the bankrupt Wisconsin Engine Co., Corliss, Wis., to be set aside and a new proceeding of sale held. Judge Geiger declares the former proceeding intolerable and says E. O. Nye, referee in bankruptcy, is guilty of gross irregularities. The plant brought $120,000 at the former sale and the referee's fee was $1,200. The petition of Bosch and Titusville stated that the sale was held without due notification of all creditors, including themselves.



New Ford Couplet selling for $750. Note louvres in hood

British Exports $17,204,475 in 8 Months of 1914

LONDON, ENG., Sept. 15—During the first 8 months of 1914 ending August 31, the total value of the British automobiles, chassis, parts, motorcycles and parts thereof exported to foreign countries was $17,204,475, while the total value of the imported cars, motorcycles, parts and accessories totaled $27,474,700 or $10,270,225 more than what the British manufacturers exported.

As a comparison with the United States export and import business the total for the first 8 months of this year are not available, but those for 7 months show that during that period the American motor car and parts manufacturers exported such goods to the value of $20,729,440 and imported only $781,460. Judging from the way exports have been increasing it is fair to estimate that during the eighth month of this year the value of the exports totaled fully $2,500,000 which would bring the total export trade of the American makers during 1914 up to August 31, to $23,229,440 or $6,000,000 more than the British manufacturers' business.

British Export Business for 1913 and 1914

	1914			
	August		Eight Months	
	Number	Value	Number	Value
Cars	437	$657,885	4,123	$6,548,420
Chassis	80	163,860	845	1,885,980
Total	517	$821,745	4,968	$8,434,400
Tires	...	$110,380	.....	$1,820,330
Parts	...	192,955	.....	2,693,610
Total	...	$1,125,080	.....	$12,958,340
Motor cycles, tires, accessories	1,324	.....	14,231	.....
Total	...	$1,510,685	.....	$17,204,475

	1913			
	August		Eight Months	
	Number	Value	Number	Value
Cars	610	$947,250	4,760	$7,367,925
Chassis	97	166,020	837	1,600,975
Total	707	$1,113,270	5,597	$8,968,900
Tires	...	$226,155	.....	$2,468,820
Parts	...	277,500	.....	2,628,355
Total	...	$1,616,925	.....	$14,066,075
Motor cycles, tires, accessories	1,130	.....	11,428	.....
Total	...	$1,955,495	.....	$17,323,195

British Import Business for 1913 and 1914

	1914			
	August		Eight Months	
	Number	Value	Number	Value
Cars	122	$147,650	6,385	$7,466,160
Chassis	97	96,990	5,861	6,935,750
Total	219	$244,640	12,246	$14,401,910
Tires	...	$140,005	.....	$7,646,880
Parts	...	122,305	.....	4,662,255
Total	..	$506,940	.....	$26,711,045
Motor cycles, tires, parts	97	.....	2,179	.....
Total	...	$555,335	.....	$27,474,700

	1913			
	August		Eight Months	
	Number	Value	Number	Value
Cars	504	$659,505	4,706	$6,033,120
Chassis	679	785,505	5,539	6,537,950
Total	1,183	$1,445,010	10,245	$12,571,070
Tires	...	$1,183,935	.....	$9,153,435
Parts	...	408,870	.....	3,849,325
Total	...	$3,037,815	.....	$25,573,830
Motorcycles, tires, parts	80	.....	1,323	.....
Total	...	$3,134,235	.....	$26,498,480

Overland Net Earnings, $5,864,858

NEW YORK CITY, Sept. 29—The Willys-Overland Co., Toledo, O., has issued its report for the year ended June 30, last. The income account follows: Net earnings, $5,864,858; reserve for contingencies, $300,000; interest on floating debt, etc., $333,583; total deductions, $633,584; balance net income, $5,231,274; preferred dividend, 7 per cent., $350,000; balance for common, $4,881,274; common dividends, 11 per cent., $2,200,000; balance, $2,681,274; provision for retirement for preferred stock, $250,000; surplus, $2,431,274; previous surplus, $3,070,959; total surplus, $5,502,233.

The balance sheet, as of June 30 last, follows:

Assets—Property investment, $22,291,784; investments in and advances to affiliated companies, $2,156,029; materials and supplies, $7,116,433; balance due from European distributing agent, $656,199; accounts receivable, less reserve, $2,929,660; notes receivable, $1,301,771; miscellaneous investment, $53,525; cash, $2,112,760; deferred charges, $119,679; total assets, $38,737,840.

Liabilities—Preferred stock, $5,000,000; common stock, $20,000,000; capital stock, sub-companies, $12,825; real estate mortgages assumed, $131,500; bills payable, $3,900,856; accounts payable, $1,727,202; payroll and salaries accrued, $174,570; customers' deposits, $287,111; taxes and interest accrued, $102,260; reserve for quantity and other rebates to customers, $682,005; reserve for car repairs under guarantee, $30,000; preferred stock dividends due, $87,500; reserve fund, $1,099,778; profit and loss surplus, $5,202,233; total liabilities, $38,737,840.

The balance available for the common stock is equal to 24.40 per cent. on the $20,000,000 outstanding.

S. G. V. in Reorganization Receivership

READING, PA., Sept. 28—With a view to reorganizing, certain officials of the S. G. V. Co., Reading, Pa., a Pennsylvania corporation, applied for a receivership last week. R. E. Graham, president of the S. G. V. Co., and vice-president of the S. G. V. Co. of Delaware, a holding company, was named. A creditors' meeting will be held today, after which, it is anticipated, that the factory, which has been temporarily shut down, will resume operations and work will be begun on the plan of reorganization. The receivership proceedings are intended to dispose of the holding company, which has a liability charge against the held company. Assets are said to be about double the liabilities.

Chandler Declares Extra 10 Per Cent. Dividend

CLEVELAND, O., Sept. 28—*Special Telegram*—A special dividend of 10 per cent. on the common stock of the Chandler Motor Car Co., the second dividend paid on the common stock within 90 days, was declared at the regular meeting of the board of directors today. In addition to the common stock dividend the regular quarterly preferred stock dividend of 1.75 per cent. was declared. After the payment of these dividends the company still had a surplus equal to the amount of its original cash capital.

Although the company has been manufacturing cars for less than 2 years the report of the treasurer of September 1 indicated a remarkably successful business. The sales manager's report showed a let up in business early in August at the beginning of the foreign war, but since that time sales have shown a healthy increase and the factory is now running on full production, with reports from all sections of prospects for a large Fall business. Even the South, which 30 days ago was affected by the cotton situation, is showing increased orders and the business from the grain-producing sections and the Pacific Coast is breaking all records.

Automobile Committee for N. Y. Tercentenary

NEW YORK CITY, Sept. 26—It has been decided by the Automobile Committee in charge of the Commercial Tercentenary automobile pageant on the night of Wednesday, October 28, to hold a contest for King and Queen of the pageant. This is to be decided by vote and is to be done in an unique way. The plan adopted for the coming contest is to allow each registered owner of an automobile in New York State one vote for King and Queen. Governor Glynn's acceptance of the Committee's invitation to ride at the head of the automobile pageant and review it from the Court of Honor, was welcomed by the Committee and other high officials will be invited to ride with the Governor.

The Automobile Committee has been made up and is composed of a number of sub-committees, totaling more than fifty members altogether. Elmer Thompson is chairman; George H. Duck, vice-chairman; M. L. Downs, secretary, and William C. Poertner, chief marshall. The chairmen of the sub-committees form the Executive Committee and include the following: Automobile Manufacturers Committee, Alfred Reeves; New York Automobile Dealers and Garages, M. J. Budlong; Brooklyn Automobile Dealers and Garages, Herbert L. Carpenter; Automobile Dealers and Clubs, A. G. Batchelder; Tires and Accessories, William M. Sweet; Importers, Emanuel Lascaris; City, State and Inter-State Departments, Commissioner William J. Lee; Transportation, Light and Power, R. W. Meade; Hotels and Amusements, H. M. Swetland; Clubs, Societies and Lodges, G. Murray Hulbert; Motorcycles, F. M. Baker; Automobile Daily Press, John C. Wetmore; Automobile Trade Press, Julian C. Chase.

N. Y. Dealers Fight Separator Repeal Veto

NEW YORK CITY, Sept. 28—The dealers and garagemen of New York City are preparing for the final move in their fight against the gasoline separator ordinance. They will attempt to have it repealed over the veto of Mayor John Purroy Mitchel.

The Board of Aldermen by a vote of 57 to 1 repealed the law which compels the installation of separators in garages, but the Mayor vetoed the repeal, explaining his act in a lengthly message.

The garage interests will appear this week before the general welfare committee of the Board of Aldermen and will offer evidence in refutation of the statements made in the message. Following this hearing the committee will report its recommendations to the Aldermen and the board will vote again on the measure. A three-quarters vote is necessary to pass the repeal over the Mayor's veto, but the garagemen have hopes of success. The vote will be taken October 6.

The main contention of the garagemen, that the separators do not operate at all successfully, was not touched upon in the Mayor's message, and this will be brought out with renewed emphasis in the present proceedings. Following the veto, the garage interests of the city held a consultation after which President R. H. Johnston of the Automobile Dealers' Association issued a statement which summarizes the testimony which will be given before this week's committee hearing. It follows:

The old officers of the New York Garage Association were retained at the annual meeting of the association held Thursday, September 24, at the Hofbrau Haus, New York City, and the gasolene separator question and the prospective raising of storage prices were discussed.

The garagemen have entered anew into the trade's fight against the separator, and will continue in an effort to have the repeal of the obnoxious ordinance passed over the veto of Mayor John Purroy Mitchell.

The proposed storage change consists in raising storage $5 a month and putting gasolene on a 5-cent profit basis. Heretofore storage has shown little or no profit, the profit of the garage business being derived from gasolene. But filling stations with their low prices have made a profitable storage almost imperative, and Thursday, October 1, it is planned that rates on the West Side, at least, be increased.

Rates are in two grades—A and B. A rates apply to the more modern buildings and will be $30 and $35; B rates will be $35 and $40.

The officers are: President, Louis J. Joscelyn, Joscelyn Garage; vice-president, William Burrows, Niagara Garage; secretary, Charles H. Potter, Uptown Garage; treasurer, William M. Haradon, Royal Garage. Directors: Bronx—W. L. Byrnes, Byrnes Garage; C. A. Otten, Bronx Garage. Washington Heights—H. L. Hulse, Hulse Garage; S. W. Childs, (new) Childs Garage. Upper West Side—William M. Haradon, Royal Garage; J. Bierman, Manchester Garage. Lower West Side—Ben Blumenthal, (new) West End Auto Palace; Morris Segall, Apthorp Garage; James S. McIntosh, McIntosh Garage. East Side—William Burrows, Niagara Garage; Joseph Stafford, Duford Garage. Downtown—Louis J. Joscelyn, Joscelyn Garage; Frank S. Hannah (new), 49th Street Garage. Harlem—Charles H. Potter, Uptown Garage; Charles Strathman, Strathman Automobile Co.

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SAN FRANCISCO, Sept. 25—The latest figures given out by the California motor vehicle department are 114,657 licenses issued to automobiles up to September 20.

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DETROIT, MICH., Sept. 25—The Bower Roller Bearing Co., this city, has declared its semi-annual dividend of 5 per cent.

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BATAVIA, N. Y., Sept. 25—The Batavia Rubber Co. has declared a quarterly dividend of 1 1-2 per cent. on the preferred stock and a quarterly dividend of 1 per cent. on the common stock and an extra dividend of three-fourths of 1 per cent. on the common, payable October 1.

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Standard Oil Case Before Grand Jury

JERSEY CITY, Sept. 25—Assistant Prosecutor G. T. Vickers of Hudson County today declared that the complaint against the Standard Oil Co. by the Crew-Levick Oil Co., which was dismissed by Judge Mark A. Sullivan on September 21, would be submitted to the grand jury.

In a statement today he said: "The complaint against the Standard Oil Co. for having violated one of the so-called 'Seven Sisters' acts will be submitted to the present grand jury at the earliest possible date, giving that body the benefit of all the testimony available to the state."

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Government May Buy Trucks Next Spring

WASHINGTON, D. C., Sept. 26—It is likely the government will be in the market early next year for a big fleet of motor trucks. Postmaster-General Burleson is conferring with a special committee of postmasters and post office department officials looking to the substitution of government-owned motor trucks for screen mail wagons.

Contracts for screen wagon delivery in thirty leading cities expire next June and will not be renewed if the department decides that motor trucks are more economical and efficient.

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N. Y. City Wins Taxicab Stand Fight

NEW YORK CITY, Sept. 29—The fight of the large taxicab operating corporations and the more pretentious hotels against the establishment of taxicab stands in front of the hotels by the New York City authorities has ended in favor of the city. Ornamental signs this week are being placed in front of all hotels and at all points where the city desires cabs stands. Each sign states the number of motor and horse cabs that may occupy the stand.

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Ohio Tail Lights to Be Green?

CLEVELAND, O., Sept. 28—At a meeting of the legislative committee of the Ohio State Automobile Assn. held in this city it was decided to introduce bills at the next session of the legislature for the following purposes: Requiring all vehicles to carry lights at night, requiring tail lights to be green instead of red, reducing the dealers' license to $10, and requiring the elimination of headlight glare on country roads as well as on city streets.

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BOSTON, MASS., Sept. 29—Gray and Davis, Inc., have declared their regular quarterly dividend of 1 3-4 per cent. on the preferred stock, payable October 1, 1914, to all stockholders of record at the close of business September 22. President William Gray reports that the factory is operating day and night.

Market Reports for the Week

This week's markets showed a downward tendency in prices. A weaker tone prevailed this week in most of the quotations. Most of the metal markets showed a decline. None of the prices showed a gain. In the rubber market further importations from Brazil are reported. The market retained a very steady tone. Only one change occurred in the oils and lubricants markets, and that was a decline of $0.02 for linseed oil. The rest of the markets were generally steady. The shipments of some of these products have been successful. The Norwegian bark Grande, has been engaged to take 6,000 barrels of refined petroleum, from New York to Copenhagen.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Changes
Antimony	.09	.09	.09	.09	.09	.09	.....
Beams & Channels, 100 lbs	1.31	1.31	1.31	1.31	1.31	1.31	.....
Bessemer Steel, ton	20.00	20.00	20.00	20.00	20.00	20.00	.....
Copper, Elec., lb.	.11⅞	.11⅞	.11⅞	.11¼	.11	.11⅛	—.00¾
Copper, Lake, lb.	.12⅛	.12⅛	.12⅛	.12⅛	.12	.12	—.00⅛
Cottonseed Oil, bbl.	5.65	5.65	5.65	5.65	5.63	5.50	—.15
Cyanide Potash, lb.	.32	.32	.32	.32	.32	.32	.....
Fish Oil, Menhaden, Brown	.40	.40	.40	.40	.40	.40	.....
Gasoline, Auto, bbl.	.13	.13	.13	.13	.13	.13	.....
Lard Oil, prime	.93	.93	.93	.93	.93	.93	.....
Lead, 100 lbs	3.85	3.75	3.75	3.75	3.75	3.75	—.10
Linseed Oil	.58	.58	.56	.56	.56	.56	—.02
Open-Hearth Steel, ton	20.00	20.00	20.00	20.00	20.00	20.00	.....
Petroleum, bbl., Kans., crude	.55	.55	.55	.55	.55	.55	.....
Petroleum, bbl., Pa., crude	1.45	1.45	1.45	1.45	1.45	1.45	.....
Rapeseed Oil, refined	.82	.82	.82	.82	.82	.82	.....
Rubber, Fine Up-River, Para	.65	.65	.65	.65	.65	.65	.....
Silk, raw, Ital.	..	4.60	..	..	4.60	..	.....
Silk, raw, Japan	..	3.72½	..	..	3.72½	..	.....
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	31.50	31.12½	31.00	30.875	30.875	30.75	—.75
Tire Scrap	.05	.05	.05	.05	.05	.05	.....

116 Franklin Sixes Average 11 M. P. H. on Low Gear

Dealers All Over Country Drive Under All Conditions for 8 Hours and 54 Minutes

SYRACUSE, N. Y., Sept. 26—One hundred and sixteen six-cylinder Franklin cars, driven by dealers in as many different cities, ran all day long on low gear Thursday, September 24. These 116 cars covered about 100 miles each in the average time of 8 hours 54 minutes, which is at the average speed of approximately 11 miles an hour. The average consumption of gasoline was 12.01 gallons and of oil about 1.17 gallons. James Sweeten, Philadelphia dealer, completed the 100 miles in 6:55, which averages 14.4 miles per hour and is the fastest time made.

Of the 116 cars to start, but one failed to finish. The Pittsburgh, Pa., dealer was forced to stop after covering 95 miles because of magneto trouble.

The tests were made under widely differing conditions. The highest temperature encountered was in Redlands, Cal., and in Concord, N. H., where the thermometer registered 92 degrees Fahrenheit. The lowest temperature was in Fort Dodge, Ia., where the mercury stood at 52 degrees.

In holding this national demonstration, which follows the national fuel economy demonstration which was run off May 1, and in which 94 Franklin cars averaged 32.8 miles to the gallon of fuel, the Franklin Automobile Co., Syracuse, N. Y., had in mind not so much a plan to make plain that the Franklin system of direct cooling by air will cool, for that fact already is well established.

That there might be no doubt of the authenticity of the test, it was officially observed and the records sworn to before a notary public at the conclusion of the run. Each car carried, in addition to the driver, two observers who in a great many cases were high civic officials and in others were newspaper men.

The routes which were chosen for the test included some of the hardest which could be found in the territories of the various dealers, and the runs were made regardless of weather and road conditions. Thus, for instance, the Bar Harbor, Me., dealer was obliged to make four detours through rough pasture land; The Wilkes-Barre, Pa., dealer finished at the top of the famous Giant's Despair Mountain; the Denver, Col., dealer climbed to the top of Berthoud Pass and finished on Lookout Mountain at an elevation of 11,500 feet; the Greensburg, Pa., dealer drove continually in rain; the Carthage, N. Y., dealer also drove in pouring rain and by way of adding a feature finished with a little girl standing barefoot on top of the engine bonnet; the Pittsfield, Mass., dealer finished at the top of the Jacob's Ladder; the Los Angeles, Cal., dealer negotiated what is considered to be the hardest climb in the State and finished at the top of Wilson's Peak at an altitude of 5,800 feet.

The cars that were used for the test were stock demonstrators, and in making the 100-mile run on low gear their engines turned over the equivalent of 336 miles on high gear.

Kansas City Dealers Hold 6-Day Tour

KANSAS CITY, MO., Sept. 25—Fourteen motor cars—all stock models of the 1915 lines—proved their worth in the second annual trade winning tour of the Kansas City Motor Car Dealers in a 6-day run through Kansas last week. The cars left Kansas City in the mud of a 5-inch rain that had fallen in a cloud-burst the night before.

One day of the trip was given over to the Kansas state fair at Hutchinson, at which the cars were parked and demonstrated. The cars that made the trip were the Chevrolet, Paige, Mitchell, Case, Paterson, Jackson, Allen, Krit, Pathfinder, Oldsmobile, Briscoe, Buick, Chandler, Car Nation and Saxon. The route took in Ottawa, Emporia, Newton, Hutchinson, McPherson, Salina, Manhattan, Topeka and Lawrence. Stops were made at each place and the cars demonstrated to local prospects and dealers.

Denver Show and Races Make Big Hit

DENVER, COLO., Sept. 26—Thirty-one cars were exhibited in Denver's first fall automobile show yesterday and today, and the event was so well attended that some of the dealers are already urging that it be made an annual affair. The show and 2-day race meet combined were attended by nearly 10,000 people.

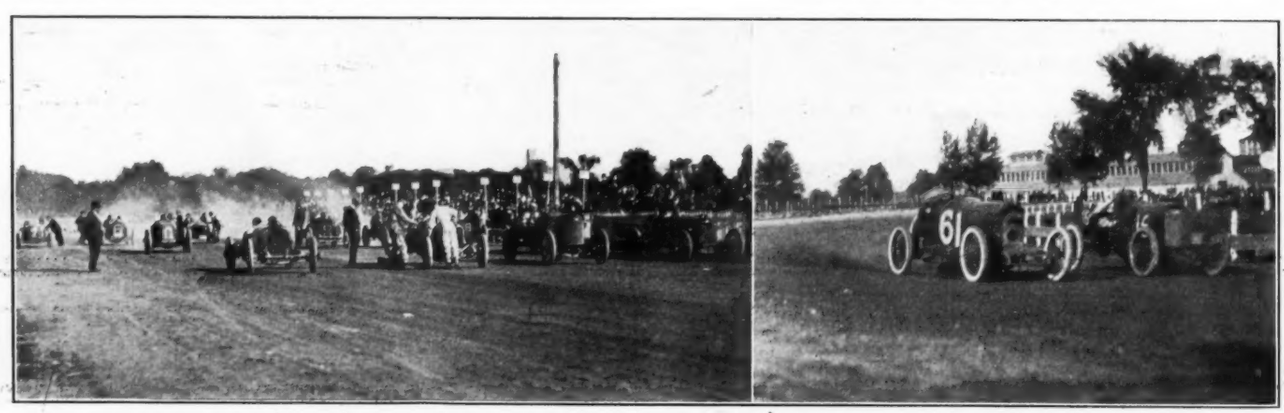
The makes shown were the Empire, Hudson, Pathfinder,

Name of City	Miles Traveled	Gallons Gasoline Used	Gallons of Oil Used	Temp.	Weather and Road Conditions
Abilene, Texas	100	12.3	.6	60°	Fair
Akron, Ohio	104	7	.4	64°	Mud
Albany, N. Y.	100	12	.9	62°	Clear
Amboy, Ill.	100	14	.8	65°	Clear
Atlanta, Ga.	102	10.5	.7	64°	Heavy
Auburn, N. Y.	100	14	.8	58°	Muddy
Baltimore, Md.	100	12	1.8	82°	Bad
Bar Harbor, Me.	112	14	.5	80°	Rough
Billings, Mont.	100.7	10	1.3	80°	Fair
Binghamton, N. Y.	100.5	9	.8		Muddy
Boston, Mass.	100	16.2	1.6	87°	Clear
Bridgeport, Conn.	100	8	1.2	84°	Clear
Buffalo, N. Y.	104	14.5	2	56°	Rain
Calgary, Alberta	100	10	.3	80°	Clear
Canton, Ohio	100	11.2	.7	65°	Fair
Carbondale, Pa.	100	12.5	1.2	62°	Rough
Carthage, Mo.	100.7	11.1	1.5	75°	Clear
Carthage, N. Y.	100	11	1.6	66°	Heavy
Cherokee, Ia.	100	11.2	.9	56°	Fair
Chicago, Ill.	100	12	1	58°	Clear
Cincinnati, Ohio	100	12	1.2	67°	Fair
Cleveland, Ohio	100	11.5	.9	68°	Clear
Colorado Spgs., Col.	109.5	12.5	.9	65°	Hilly
Columbia, S. C.	100	11	1.3	80°	Showers
Columbus, Ohio	100	11.5	.8	54°	Rain
Concord, N. H.	100	12		92°	Clear
Cortland, N. Y.	100	13.7	1.3	57°	Mud
Cumberland, Md.	101	10	1.3	67°	Rain
Dallas, Texas	100	11	1.2		Clear
Dayton, Ohio	100	12	.7	64°	Fair
Denver, Col.	118	14.5	1	63°	Clear
Detroit, Mich.	106	12	2.5	55°	Rain
Duluth, Minn.	100	16.5	1	44°	Bad
Eau Claire, Wis.	100	15	1.3	62°	Windy
Elizabeth, N. J.	100.1	11.5	1.5	86°	Hot
Erie, Pa.	100	15	1.2	80°	Muddy
Fall River, Mass.	100.5	12.5	.9	88°	Hot
Forsyth, Mont.	100	19.5	1	75°	Fair
Fort Dodge, Ia.	100	9.2	.8	52°	Clear
Fort Plain, N. Y.	100.4	12	2	58°	Fair
Galesburg, Ill. Car 1	100	10.5	1.3	70°	Clear
Galesburg, Ill. Car 2	100	12.5	1.3	70°	Clear
Geneva, N. Y.	101	10.2	1.2	58°	Rain
Georgetown, Texas	100	15.7	1.2	73°	Fair
Grand Forks, N. D.	100	10	1	54°	Clear
Great Falls, Mont.	100.1	10	1.1	76°	Clear
Greensburg, Pa.	100	11.5	2	65°	Bad
Greenville, S. C.	100.8	13.5	1.9	76°	Showers
Hampton, Va.	100	8	2.5	82°	Fair
Hartford, Conn.	100	11	1.2	80°	Clear
Hoosic, N. Y.	100	11.9		60°	Clear
Houston, Texas	100	18	1.5	75°	Muddy
Ishpeming, Mich.	101.5	10.5	1	56°	Heavy
Kankakee, Ill.	100	11	.6	74°	Fair
Kansas City, Mo.	100	10.6	2	71°	Fair
Kingston, N. Y.	101.5	17	1.6	70°	Cloudy
La Crosse, Wis.	102.5	12.5	.7	66°	Fair
Laramie, Wyo.	100	9.8	.7	78°	Clear
Lexington, Ky.	105	8.2	.7	78°	Hilly

Name of City	Miles Traveled	Gallons Gasoline Used	Gallons of Oil Used	Temp.	Weather and Road Conditions
Lincoln, Neb.	104	21		70°	Fair
Los Angeles, Cal.	108.5	11	1.5	62°	Clear
London, Ont.	100	8.4	1	68°	Muddy
Louisville, Ky.	100	10	1	67°	Clear
Milwaukee, Wis.	100	10	.9	54°	Dry
Minneapolis, Minn.	100	13	.6	58°	Sand, hilly
Moline, Ill.	100	11	2	67°	Clear
Montreal, P. Q.	100	9	1	59°	Muddy
Nashville, Tenn.	100	13	1.2	67°	Fair
Newark, N. J.	100	11	.9	61°	Clear
New Bedford, Mass.	100	16	1.2	75°	Dry
Newburg, N. Y.	100	10	.9	74°	Clear
New Haven, Conn.	100	11.2	1.2	80°	Sand, hilly
New York City	100	10.6	.5	81°	Dry
Norwich, N. Y.	100	11.5	3	58°	Bad
Oil City, Pa.	100	12	.9	56°	Mud
Oklahoma City, Okl.	114.7	11	.4	74°	Clear
Pawnee Neb.	100	10.5	1	72°	Clear
Pendleton, Ore.	100.6	14	.6	56°	Clear
Peoria, Ill.	100	11	1.2	75°	Clear
Philadelphia, Pa.	100	12	1	82°	Roads bad
Phoenix, Ariz.	100	11	1	78°	Clear
Pittsfield, Mass.	100.5	9	1.3	69°	Cloudy
Pittsburgh, Pa.	95*				Rainy
Portland, Me.	100	12	1	80°	Hilly
Portland, Ore.	101.3	11	1.2	74°	Fair
Providence, R. I.	100	10.2	1.3	80°	Clear
Putnam, Conn.	100	14		86°	Fair
Redlands, Cal.	100	10		92°	Fair
Rochester, N. Y.	100	9	1.2	80°	Rain
Rockford, Ill.	100	11.5	1.1	68°	Hills
St. Louis, Mo.	130.7	14.7	1.1	72°	Hills
St. Paul, Minn.	100	15	1.5	48°	Fair
San Angelo, Tex.	100	11.7	.8	82°	Fair
San Antonio, Tex.	102.7	12.9	1.2	86°	Fair
San Diego, Cal.	100.3	16.5	1.6	76°	Fair
San Francisco, Cal.	113.5	12.5	1.6	70°	Bad
Saranac Lake, N. Y.	100	20.2	1.2	60°	Rain, hilly
Scranton, Pa.	100	14.7	1.4	61°	Rough
Seattle, Wash.	103	11	1.2	56°	Fair
Sharon, Pa.	100	11	1.2	60°	Muddy
Shreveport, La.	100	16	2.1	66°	Clear
Sioux City, Ia.	100	8	1.0	85°	Fair
Sioux Falls, S. D.	100	11	1.2	73°	Fair
Springfield, Ill.	100	12	1.0	85°	Fair
Springfield, Mass.	106	12.7	.5	86°	Fair
Springfield, Mo.	100	11.8	.9	70°	Clear
Syracuse, N. Y.	104	10	2.0	58°	Rain
Utica, N. Y.	105.2	11	1.0	58°	Bad
Walla Walla, Wash.	101.7	12	1.2	56°	Rain
Walton, N. Y.	100	11.5	1.3	57°	Fair
Washington, Ia.	100	12.5	1.2	72°	Wet
Waterloo, Ia.	100	12.2	1.4	60°	Clear
Wilkesbarre, Pa.	100	12	1.2	71°	Showers
Worcester, Mass.	100	14	1.1	86°	Clear
Yankton, S. D.	100	10.2	.8	70°	Clear
York, Pa.	100	12	1.2	71°	Rough
Youngstown, Ohio	100	7.2	1.2	60°	Muddy

*Accident to magneto prevented finish.

Results of Franklin low gear test



Left—Cars lined up before the start in Kalamazoo, Mich., 100-mile race. Right—Burman and Newhouse fighting it out on a turn

Studebaker, Regal, Briscoe, Winton, Jeffery, Buick, Abbott-Detroit, Chalmers, Detroiter, Crescent, Chevrolet, Maxwell, Overland, Moon, Hupmobile, Ford, Franklin, Reo, Oldsmobile, and the Fritchle, Baker and Rauch-Lang Electrics.

There were hundreds of visitors from outside of Denver and many prospective sales developed. The dealers are highly pleased with the outlook for the 1915 business and believe the show and race meet will prove a substantial trade stimulant.

The results of the races were as follows:

Five-mile, Gaston Morris, Buick, first; time, 5:21; Bob Murray, Buick, second, 5:30; E. W. Swanbrough, Mercer, third, 5:38 1-2. Fifteen-mile, Harold Brinker, White, first, 15:15 1-5; Bob Murray, Buick, second, 16:04 4-5; Gaston Morris, Buick, third, 16:05. Twenty-five-mile, Harold Brinker, White, first, 26:39 1-5; Bob Murray, Buick, second, 27:04 3-5; Steve Elmore, Stutz, third, 27:07 1-5. Morris made an exhibition mile in 1:01 flat in an effort to meet Barney Oldfield's record of 54 1-5 for the Overland course.

Other entrants in the motor car events were A. C. Wagner in an Amplex, G. M. Edwards in a Palmer-Singer, Ben Knott in an Empire, H. M. Condit in a Hupmobile and H. N. Isenberg in an Abbott.

A fifteen-mile event started yesterday was stopped after the tenth lap on account of an accident killing one of the drivers, E. W. Swanbrough. He went into a bad curve with his Mercer so close to three bunched cars just ahead that he was blinded by the terribly heavy dust and crushed when his car swerved from the track and tore through a fence. He died on the way to the hospital.

Burman and Peugeot Star at Kalamazoo Century

KALAMAZOO, MICH., Sept. 26—Burman, driving his French Peugeot, gained new laurels in the century dash staged by the Kalamazoo people today. He took down the first prize of $1,000 in gold coin and established new world's records for 75 and 100 miles.

It cannot be said that Burman's victory was easily gained, for it was not. Eddie O'Donnell, in one of the Duesenbergs, kept up the fight and trailed the Peugeot closely. Ralph DePalma, after leading for thirty-six laps, had been forced to quit on account of trouble with his eyes. O'Donnell led Burman for fifty-nine laps, at the end of which the Duesenberg driver was forced to stop to change a flat tire. Then Bob went to the front and never was headed, although O'Donnell, after a quick tire change, made up considerable lost ground and at the finish was considerably less than a lap back of the leader.

Burman's time for the century was 1:34:29 2-5, which shot a big hole in the mark of 1:40:02 established by Ralph DePalma at Brighton Beach last Labor Day. O'Donnell also got inside DePalma's mark when he finished the race in 1:35:32 3-5. Newhouse in the Delage driven to victory by Thomas in the last 500 mile race at Indianapolis, landed third money in 1:50:45 3-5 while Jack Callaghan in the Keeton finished fourth in 1:51:14.

In addition to the above named money winners, the race was contested in by Billy Carlson in a Maxwell, Wilbur D'Alene in the Marmon, Erwin Bergdoll in the Benz, Tom Alley in a Duesenberg, Will Tidemarsh in the Great Western, Grover Bergdoll in the Erwin and "Cap" Kennedy in the Cornelian, a Kalamazoo product not much larger than a cyclecar. Still running at the finish were D'Alene, Carlson, Alley, Grover Bergdoll and Kennedy. Erwin Bergdoll went out of the contest with a broken intake valve, Tidmarsh's car was eliminated by motor troubles and DePalma was forced out when dust laden with the calcium chloride with which the surface of the track was treated got into his eyes. DePalma's accident was unusual and unfortunate and through it the contest was robbed of a leading factor.

DePalma's Hard Luck

The field was bunched the first time around and at the signal DePalma and O'Donnell shot into the lead on even terms. DePalma opened up a slight gap on O'Donnell the next time around and from that point until his accident he held the advantage, the Duesenberg driver back of him in spite of efforts on the part of O'Donnell to grab the lead. DePalma turned the twenty in 18:45, the twenty-five in 23:22, the thirty in 28:06 and the thirty-five in 32:46. On the thirty-sixth lap it was seen that something was wrong with DePalma for he slowed up on the backstretch and rolled slowly around to his pit. He climbed out, tore his goggles from his eyes, covered them with his hands and rushed for a can of water in the pit. Wearing a pair of defective goggles, the dust had worked inside and filled his eyes with calcium chloride which burned the optics. Several doctors came to DePalma and removed the irritant, but in the meantime O'Donnell and the rest had gained seven laps and Ralph's case was hopeless.

Burman, as far as appearances went, might have been running his car along steel rails laid on the track, for he never varied 3 inches from a certain path, except when he would swing to the side to pass another car. He never slowed up and the rhythm of his motors was never broken for an instant. He had no tire trouble either and following the finish of the race and after skidding around four hundred turns his Nassau tires showed no wear whatever.

The summary:

CAR	DRIVER	TIME	M.P.H.
Peugeot	Burman	1:34:29 2-5	63.6
Deusenberg	O'Donnell	1:35:32 3-5	62.9
Delage	Newhouse	1:50:45 3-5	54.2
Keeton	Callaghan	1:51:14	54
Marmon	D'Alene	Still running	
Erwin Special	G. Bergdoll	Still running	
Deusenberg	Alley	Still running	
Maxwell	Carlson	Still running	
Cornelian	Kennedy	Still running	
Great Western	Tidmarsh	Out 47th lap	
Benz	E. Bergdoll	Out 24th lap	
Mercedes	DePalma	Out 36th lap	

Comparing the Six With the Eight

(*Continued from page* 618)

sideration, the eight-cylinder curves would not have been so straight.

Further, considering the increasing cost of fuel, it would seem a doubtful step to lower the thermal efficiency by increasing cylinder numbers and cutting up the volume of gas into still smaller units, and by so doing increase the areas exposed to heat in proportion to cylinder volume.

Again, the decrease in cylinder bore means still smaller valves with higher frictional resistance to the inflow of gas and consequent lower volumetric efficiency.

Time to Solve Problem

When we consider the various features of vibration, thermal and volumetric efficiency, manufacturing costs and multiplicity of parts, the eight-cylinder motor either V type or all-in-line would appear from this theoretical investigation to have considerable of a task to justify itself.

If practical tests should, however, prove the eight to have an appreciable advantage over the six, there is no doubt but that American manufacturers will show no hesitation about building this type should there seem to be any considerable demand from the automobile buying public.

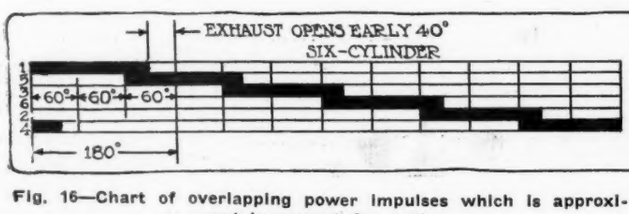


Fig. 16—Chart of overlapping power impulses which is approximately correct for a six

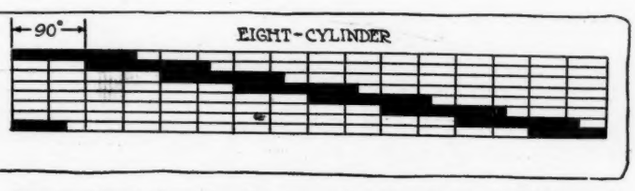



Fig. 17—Chart of overlapping power impulses for an eight drawn in the same way as Fig. 18

Factory Miscellany

10,000 Chevrolets for 1915—The Chevrolet Motor Co., Flint, Mich., is planning to build at least 10,000 Chevrolet cars for the 1915 season in its Flint plants. The New York factory will take care of all of the New England States and the export business, and is expected to manufacture at least 3,000 cars. The working force will be greatly increased in both plants and within a short time the Flint plant will be turning out 50 cars a day.

Detroit Springs on Denby—The Denby Motor Truck Co., Detroit, Mich., will use springs manufactured by the Detroit Steel Products Co., Detroit.

Safety First Plant at Plainville—It is reported that the Safety First Motor Car Co. will locate its plant in Plainville, Mich., and will employ about twenty-five men to start with.

Fisher Body Adds—A two-story addition, 30 by 157 feet and to cost $10,000 will be started on the plant of the Fisher Body Co., Harper avenue and Hastings street, Detroit, Mich.

English Classes for Foreigners—The Ford Motor Co., Detroit, Mich., in co-operation with the Y. M. C. A., is establishing English classes for its foreign employees desiring to learn and to perfect themselves in that language.

Endurance Tire's New Factory—The Endurance Tire & Rubber Co. is having plans prepared for a factory to be 80 by 250 feet, one story, and of brick construction, to be erected at New Brunswick, N. J., at an estimated cost of $50,000.

Marathon Rubber Plant in St. Catharines—The ratepayers of St. Catharines, Ont., passed a by-law to grant a 5-acre site and fixed assessment of $10,000 for 10 years to the Marathon Rubber Co., Akron, O. In return the company agrees to erect buildings and a plant to cost at least $50,000 and to employ a minimum of 100 hands at the start.

Tire Plant for Buena Vista—A corporation to be known as the Williams I. X. L. Tire & Rubber Co., Buena Vista, Penn., capitalized at $300,000, has purchased a site and plans to build a plant there for the manufacture of automobile tires and commercial rubber articles.

Alpena Bids Too Low—Bids totaling only $4,500 were recorded at the sale of the property, tools, stock and outstanding accounts of the bankrupt Alpena Motor Car Co., although their total value is set at $30,000. The bids were not accepted and another sale probably will be ordered.

Elbert Co. Locates Plant—The Elbert Motor Car Co., a recent incorporation in Seattle, Wash., has located its plant at 2012 Fifteenth avenue, West, that city. In addition to manufacturing a cyclecar this company will also build a light delivery car with a carrying capacity of 500 pounds.

Auto-Rebuilding Co. Increases Output—The Auto-Rebuilding Co., Victoria, B. C., manufacturer of automobile bodies, wheels, springs, engines, etc., has been taken over by a syndicate in that city with increased powers and larger working capital. The output of the plant will be increased.

Ahlberg Bearing Co. Opens Plant—The Ahlberg Bearing Co., Chicago, Ill., has opened an office and factory in Los Angeles, Cal. This company specializes in regrinding annular ball bearings. Karl E. Ahlberg, president of the company, has taken charge of the company's interests in Los Angeles and is personally superintending the installation of the machinery.

Occupies Reliance Truck Co.—Recently the American Malleables Co., Lancaster, N. Y., secured the plant formerly occupied in Owosso, Mich., by the Reliance Motor Truck Co., and is now manufacturing all kinds of malleable iron castings, specializing in automobile work. The company contemplates operating another plant in Flint, Mich., within the next year.

Standard Welding's Third Addition—The Standard Welding Co., Cleveland, O., is building its third large addition of the year to its plant. The newest structure is of structural iron, with corrugated asbestos, metal reinforced roofing and siding. The dimensions are 60 by 240 by 30 feet high. The new building is to be devoted entirely to the storage of rims and will accommodate approximately 100,000 rims.

Chevrolet Dealers Visit Factory—About sixty Indiana dealers for the Chevrolet accompanied William J. Small, state distributor, on a visit to the factory at Flint, Mich., last week. Before going to the factory, 2 days were spent in Detroit, followed by 2 days at the factory, where there were a number of special entertainment features. The dealers drove home new cars, thus opening the 1915 season for the Chevrolet in Indiana.

Jeffrey's Cold Weather Tests in Summer—The Thomas B. Jeffery Co. has installed in the works at Kenosha, Wis., a refrigerating plant for the purpose of making cold weather tests on Jeffery carbureters, batteries and motors. In 1 hour after starting the refrigerating machinery it is possible to get a temperature of from 8 to 10 degrees below zero. The room in which this outfit is installed will accommodate one of the largest Jeffrey models and leaves plenty of room for men to work on the car. This device has been installed by the Jeffrey company so that summer experiments can be conducted under winter conditions.

The Automobile Calendar

Oct. 3-10.....Cincinnati, O., Show.
Oct. 3.....Fresno, Cal., Track Meet, Fresno Co., Agricultural Assn.
Oct. 4.....St. Louis, Mo., Automobile Show, Auto Manufacturers' and Dealers' Assn.
Oct. 5-12.....St. Louis, Mo., Show, Forest Park Highlands.
Oct. 7-8-9-10.....Detroit, Mich., First Truck Convention of Motor Truck Manufacturers', Dealers' and Owners' Organization; promoter, Motor Truck Club of America.
Oct. 7-17.....New York City Electric Vehicle Show, Grand Central Palace.
Oct. 10.....Medford, Mass., Track for Light Cars, Combination Park.
Oct. 10-17.....Boston, Mass., New England Light Car and Cyclecar Show, Horticultural Hall.
Oct. 17.....Los Angeles, Cal., Show, Shrine Auditorium.
Oct. 17-23.....Los Angeles, Cal., Show, Shrine Auditorium.
Oct. 17-24.....Pittsburgh, Pa., Automobile Show, Auto Dealers Assn., Inc.
Oct. 17-Nov. 1....Dallas, Tex., Show, State Fair Grounds, Dallas Automobile Dealers' Assn.
Oct. 19, 20, 21....Philadelphia, Pa., Elec. Veh. Assn's Convention.
Oct. 19-26.....Atlanta, Ga., American Road Congress of the American Highway Assn. and the A. A. A.
Oct. 28.....New York City, Commercial Tercentenary Celebration.
Oct. 28-31.....Milwaukee, Wis., Convention, Northwestern Road Congress, Auditorium.
Nov.....El Paso, Tex., Phoenix Road Race, El Paso Auto Club.
Nov. 8-9.....El. Paso to Phoenix, Ariz., Automobile Race.
Nov. 8-11.....Shreveport, La., Track Meet, Shreveport Auto Club.
Nov. 26.....Corona, Cal., Road Race, Corona Auto Assn.
Dec. 1-4.....New York City, Annual Meeting of the American Society of Mechanical Engineers.
Jan. 2-9.....New York City, Annual Automobile Show, Grand Central Palace
Jan. 3-10.....Buenos-Aires, Argentina, Grand Prize of Argentina.
Jan. 9-16.....Philadelphia Automobile Show.
Jan. 23-30.....Chicago, Ill., Automobile Show, First Regiment Armory.
Jan.30-Feb. 6....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Automobile Trade Assn.
Feb. 15-20.....Omaha, Neb., Show, Auditorium, C. G. Powell.
Feb. 22.....San Francisco, Cal., Vanderbilt Cup Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.
Mar. 6-13.....Boston, Mass., Show, Mechanics Bldg., Boston Auto Dealers Assn. Boston Commercial Motor Veh. Assn.
Mar. 7.....San Francisco, Cal., Panama-Pacific Exposition, Grand Prize Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.
Mar. 14.....San Francisco, Cal., Panama-Pacific Cup Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.

The Week in the Industry

Motor Men in New Roles

NEW SCRIPPS-BOOTH APPOINTMENTS—R. H. La Porte, formerly with the H. H. Franklin Mfg. Co. as Eastern sales representative, has joined the selling force of the Scripps-Booth Co., Detroit, Mich., and will appoint agents in the Eastern and Southern States. A. D. Caldwell, formerly with the Hupp Motor Car Co., Detroit, as sales representative, has joined the selling organization of the Scripps-Booth Co., and will appoint agents in the Middle, Western and Pacific States.

Menzies Sales Manager—C. M. Menzies has joined the Northwest Auto Co., Portland, Ore., as sales manager for the Cole and Reo.

Sickles Hyatt Roller Bearing Engineer—E. C. Sickles has been engaged as works engineer for the Hyatt Roller Bearing Co., Newark, N. J.

Warren Portland Studebaker Manager—D. C. Warren is the newly appointed sales manager for the Oregon Motor Car Co., Studebaker distributor, at Portland, Ore.

Merz Quits Racing—Charles Merz has quit racing to join the Findeisen & Kropf Mfg. Co., Chicago, Ill. He will represent the firm in the engineering department.

Rhodes Abbott Sales Manager—D. M. Rhodes has been appointed sales manager of the local branch of the Abbott Motor Co., at 467 Woodward avenue, Detroit, Mich.

Lloyd Treasurer—C. W. Lloyd has been made treasurer and appointed retail sales manager of the E. C. Johnson Co., Philadelphia, Pa., distributor for the Reo and Premier cars.

Gilpin Heads Milwaukee Ford—Ford business in Milwaukee, Wis., is now in charge of a direct factory representative, A. W. L. Gilpin, who has headed the Chicago branch for some years.

Mitchell Joins Barger—T. H. Mitchell has bought half the interest of L. E. Barger in the Abbott Motor Sales Co., Toledo, O. Hereafter the business will be conducted as a partnership.

McDonald Chalmers Manager—H. R. McDonald has accepted the management of the Oakland (Cal.) branch for Chalmers cars, operated by the Western Motor Car Co., of San Francisco.

Miller N. Y. Winton Sales Manager—H. J. C. Miller is sales manager of the Winton Motor Car Co., New York City. He has been a member of the Winton sales force in that city since 1906.

Sommer Allen Superintendent—L. A. Sommer, president of the Sommer Motor Co., Bucyrus, O., has been elected general superintendent of the Allen Motor Co., Fostoria, O., maker of the Allen car.

Farrington Resigns from Power Wagon—S. A. Farrington has resigned his position as editor of *Power Wagon*. Chicago, Ill., to accept the position of publicity manager for the Thomas B. Jeffrey Co., Kenosha, Wis. He is succeeded by S. A. Phillips, formerly technical editor of *Power Wagon*.

Sowers Now Manager—J. L. Judd, who managed the Jackson branch in Boston for some years, resigned recently, and A. H. Sowers, for a long time sales manager of the firm, was appointed to fill the vacancy.

Gray J-M Manager—H. W. Gray, who has been in the automobile business in St. Louis for the past 6 years, has been appointed manager of the accessories department of the H. W. Johns-Manville Co. there.

Fred Merz in Repair Business—The Guarantee Auto Repair Co. has begun business in Indianapolis and will make a specialty of rebuilding and overhauling motor cars. The company is owned by Fred P. Merz.

Buckley Ford Retail Manager—H. M. Buckley, who started with the Ford Motor Co. in Detroit in 1909 as a machinist, has been appointed manager of the retail sales department of the Ford Chicago branch.

Gibson Takes on Further Work—B. S. Gibson, Jr., formerly assistant manager of the A. G. Spaulding Bros. agency for Stevens-Duryea cars in New York City, is now in charge of the Brooklyn and Long Island business.

Allen Promoter—C. Louis Allen, formerly automobile sales manager of the Pyrene Mfg. Co., New York City, maker of the Pyrene hand fire extinguisher, has been promoted to the position of general sales manager.

Jossman Joins Chevrolet—H. R. Jossman, who was formerly traveling representative in the State of Michigan for the Oakland Motor Car Co., Pontiac, Mich., has a similar position with the Chevrolet Motor Co., Flint, Mich.

Fuller Gets Nomination—Alvan T. Fuller, who handles the Packard in Eastern Massachusetts, was nominated for representative to the Bay State legislature on the Progressive ticket last week in Malden, Mass., where he lives.

Weise Joins Winton—John S. Weise, for several years manager of the United States Tire & Rubber Co.'s branch at Los Angeles, Cal., has been appointed sales manager of the Los Angeles factory branch of the Winton Motor Car Co.

Homan Resigns from Overland—C. C. Homan has resigned as purchasing agent of the Willys-Overland Co., Toledo, O. H. V. Hawk has been appointed general purchasing agent of that company, the Gramm Motor Truck Co. and the Garford Co.

Shutt Back in Boston—W. H. Shutt, formerly manager of the H. J. Koehler Co., Boston, Mass., who went to New York some months ago, has been sent back to assume charge in his old position to push the sale of Grant cars in New England.

Johnson Klaxon's Detroit Representative—A permanent office has been opened in room 1317-1319 Dime Bank Bldg., Detroit, Mich., by the Lovell-McConnell Mfg. Co., Newark, N. J. Charles Johnson, special representative from the home office, is in charge.

Trombley Sales Manager—D. M. Trombley has become general sales manager of the De Luxe Automobile Co., St. Louis, Mo. He was formerly with the Pathfinder Motor Car Co., also the Cole Motor Car Co., of Indianapolis, and the Cole Motor Car Co., of Missouri.

Holleyhead Federal District Sales Manager—A. F. Holleyhead has been appointed district sales manager of the Federal Motor Truck Co., with headquarters in Chicago, Ill. Mr. Holleyhead was formerly manager of the Detroit branch of the Gibney Tire Co.

Bond District Sales Manager—W. W. Bond has been appointed district sales manager for the states of Indiana and Kentucky, for the Detroit Electric Sales Co., Indianapolis, Ind., agent for the Detroit electrics. His headquarters will be at Meridian and Walnut streets, Indianapolis.

Kjeldsen with Holdbrook—S. J. Kjeldsen, who has been associated with the foreign car business in this country for some time, has joined the Holbrook Co., New York City, builder of automobile bodies.

Jackson Sole Owner—J. R. Jackson, during the last three years manager of the Stratton-Woodcock Automobile Co., Grand Rapids, Mich., is now sole owner of that concern, having bought out the interest of the other stockholders. A new salesroom is to be opened by him opposite the present agency and the Paige-Detroit will be handled from there.

Westcott Men Promoted—When H. G. Root of Springfield, O., succeeded H. L. Ashley as secretary-treasurer and general manager of the Westcott Motor Car Co., Richmond, Ind., G. F. McCurty, who had held the position of sales manager, became assistant general manager, while H. P. Mammon formerly district sales manager for the Cole Motor Car Co., in the central states, became sales manager of the Westcott company.

Chandler Change in Cal.—A change has taken place in the handling of the Chandler cars in California. The Peacock Motor Sales Co., Los Angeles, Cal., has been appointed distributor for Northern California, Nevada and the Hawaiian Islands, while the Pearson Motor Car Co. will handle the car in San Francisco. George A. Peacock is general sales manager there and Roy B. Alexander is manager in San Francisco. The other officers are: George Pearson, Jr., and E. L. Peacock.

Prominent Detroiters Are Bank Directors—Four of the best known men in the automobile business in Detroit, Mich., are members of the Board of Directors of the Merchants National Bank, which was recently organized here. These men are: Walter O. Briggs, president of the Briggs Mfg. Co.; Hugh Chalmers, president of the Chalmers Motor Co.; Horace E. Dodge, vice-president and general manager of Dodge Bros., and Eugene W. Lewis, secretary-treasurer of the Timken-Detroit Axle Co.

Automobile Agencies Recently Established

PASSENGER CARS

Alabama

Birmingham	Dodge	Saunders Motor Car Co.
Mobile	Haynes	Motor Machine Co.
Oakman	Moon	W. H. Utley

Arkansas

Little Rock	Cole	W. E. Bell Auto Co.

British Columbia

Vancouver	Franklin	Consolidated Motor Co.

California

Los Angeles	Dodge	Harold L. Arnold
Los Angeles	Haynes	Bekin-Speers Motor Co.
Los Banos	Haynes	N. Y. Hulen
Oakland	Premier	A. B. Cosby Motor Co.
Sacramento	Chalmers	Bert S. Bingham
Santa Cruz	Oldsmobile	Hubbs & Brisac
San Diego	Mercer	Pacific Auto Co.
San Diego	Simplex	Pacific Auto Co.
San Diego	Stutz	Pacific Auto Co.
San Francisco	Apperson	Myers Motor Car Co.
San Francisco	Dodge	H. O. Harrison Company
San Francisco	Premier	A. B. Cosby Motor Co.

Canada

Sherbrooke, Que.	Reo	R. A. Webster

Connecticut

Hartford	Empire	Keeney Garage
Hartford	Oakland	Auto Tire Co.
South Norwalk	Cole	Vaast Bros. Garage

District of Columbia

Washington	Briscoe	The Briscoe Sales Co.
Washington	Haynes	The Briscoe Sales Co.
Washington	Hupmobile	Crescent Motor Co.

Florida

Live Oak	Cole	E. F. Dougherty
Sanford	Apperson	C. F. Williams
St. Petersburg	Haynes	Cramer B. Potter

Georgia

Atlanta	Apperson	Southern Apperson Co.
Waynesboro	Apperson	J. O. Applewhite

Idaho

Boise	Franklin	Norman Gratz

Illinois

Altoona	Cole	Eleventh Ave. Garage
Argenta	Apperson	J. A. Eyman
Aurora	Haynes	Auto Accessories Co.
Bethany	Haynes	Hudson & Scott
Champaign	Cole	J. L. Wiese
Chatsworth	Herff-Brooks	T. C. Baldwin
Chenoa	Glide	F. E. Cunningham
Chestnut	Apperson	O. F. Downey
Chicago	Oakland	Schillo Motor Sales Co.
Cissna Park	Glide	Herman Cluver
Danville	Apperson	Barger Sales Co.
Decatur	Cole	W. L. Shellabarger & Sons
Effingham	Cole	Curry Motor Car Co.
Elliott	Herff-Brooks	Nels Sunnes
Gardner	Apperson	Knut Mathison
Gibson City	Apperson	Wm. A. Susdorf
Greenville	Cole	Auto Supply & Sales Co.
Hammond	Haynes	E. B. Leavitt
Hillsboro	Cole	Wiley & Williams Garage
Jerseyville	Apperson	W. F. Shephard
Joliet	Haynes	Joliet Motor Co.
Kilbourne	Haynes	A. E. Sauer
Lee	Apperson	S. Ostewig & Co.
Oregon	Apperson	R. O. Sayner
Owaneco	Glide	I. M. Luzader
Pleasant Plains	Apperson	John Lehman
Princeton	Apperson	Evans-Coppins Co.
Quincy	Apperson	Quincy Garage
Rockford	Studebaker	C. B. Williamson
Springfield	Haynes	J. Earl Bell
Stonington	Apperson	F. A. Gleason
Utica	Glide	W. W. Wylie

Indiana

Evansville	Cole	R. D. King
Indianapolis	Dodge	Steinhart-Eckler Auto Co.
Indianapolis	Krit	Krit-Auman Auto Sales Co.
Salem	Cole	C. M. Crim
Winchester	Haynes	H. K. Wright

Iowa

Bonaparte	Haynes	Blackford & Blackford
Boxolm	Apperson	Ecklund & Burkgren
Brooklyn	Apperson	B. W. Sloan
Clear Lake	Haynes	H. D. Mason
Cresco	Haynes	Woods & Milz
Deep River	Glide	C. M. Shaffer
Des Moines	Apperson	Apperson Iowa Co.
Des Moines	Wahl	Masebach Auto Co.
Dubuque	Dodge	Byrne Bros.
Eagle Grove	Haynes	Middletown Auto Co.
Eagle Grove	Herff-Brooks	Wm. Pletcher
Mason City	Apperson	Leaman Auto Co.
Northwood	Haynes	S. O. Thompson
Waterloo	Cole	Burd Auto & Supply Co.

Kansas

Chanute	Franklin	Chanute Auto Co.
Lawrence	Cole	C. E. Varnum
Liberal	Haynes	Liberal Auto Supply Co.
Salina	Mitchell	Ollinger Auto. Co.
Salina	Overland	Ollinger Auto. Co.

Kentucky

Glasgow	Haynes	G. R. Lewis
Greenville	Apperson	R. O. Pace
Louisville	Haynes	Van Patton Motor Car Co.
Louisville	King	Van Patton Motor Car Co.

Louisiana

New Orleans	Apperson	Bernin Auto Co., Inc.
New Orleans	Jeffery	Abbott Auto. Co. Inc.
New Orleans	R.C.H.	American Automobile Co.

Maryland

Aberdeen	Reo	Motor Sales Co.
Baltimore	Apperson	Model Automobile Co.
Salisbury	Haynes	Peninsular Motor Co.

Massachusetts

Boston	Dodge	Charles S. Henshaw
Boston	Lewis	E. A. Gilmore Co.
Springfield	Oakland	Dunbar Motor Co.
Watertown	Herff-Brooks	C. E. Mathews

Michigan

Bay City	Franklin	Oakland Auto Co.
Belding	Studebaker	Wise & Goodman
Brown City	Ford	H. C. Stimson
Detroit	Haynes	McKinney-Devlin Co.
Flint	Chevrolet	Garner Auto Sales Co.
Grand Rapids	Haynes	Adams & Hart
Grand Rapids	Haynes	Adams & Hart
Jackson	Cadillac	Ralph Lewis
Jackson	Ford	Ralph Lewis
Ludington	Oldsmobile	Donald McVichie
Plainwell	Herff-Brooks	G. H. Crawford
Port Huron	Overland	Mooney Motor Sales Co.
Saginaw	Krit	J. P. Beck
St. Joseph	Glide	E. Hofer
South Haven	Maxwell	C. A. Herriman
Woodbury	Apperson	W. R Wells

Minnesota

Minneapolis	Apperson	Nicollet Ave. Auto Co.
Minneapolis	Briscoe	Minneapolis Briscoe Motor Sales Co.
Minneapolis	Marmon	Harry J. Mich
Minneapolis	Westcott	D. G. Hedderly & Son
Sottenwood	Haynes	A. O. Hovdesven & Son

Mississippi

Greenville	Cole	H. H. Berry

Missouri

Centertown	Maxwell	Stark & Vogel
Chillicothe	Cole	Adams & Sons Grocery Co.
Kansas City	Apperson	Bruening Bros. Auto. Co.
Kansas City	Maxwell	Acton-Parke Auto Co.
Kansas City	Paige-Detroit	Greenlease Motor Car Co.
Salisbury	Cole	Stamper & Stamper
Springfield	Studebaker	D. B. Asbury
St. Joseph	Cole	Grand Center Motor Car Co.

Montana

Lewiston	Apperson	Fergus County Machine Co.

Nebraska

Omaha	Apperson	Apperson Jack Rabbit Co.
Omaha	Hupmobile	Cadillac Co. of Omaha
Omaha	Paige-Detroit	W. L. Huffman Auto. Co.
Seward	Oldsmobile	J. F. Zimmerer

Nevada

Ely	Franklin	Ely Garage & Supply Co.

New Jersey

Newark	Cole	Wallace Motor Car Co.

New York

Brooklyn	Apperson	Farrell Auto Co.
Buffalo	Briscoe	Monroe Motor Co.
Buffalo	Dodge	J. A. Cramer
Buffalo	Haynes	A. L. Dixon
Buffalo	Herff-Brooks	Henry Brunn
Buffalo	King	Mutual Motor Car Co
Penn Yan	Haynes	Wagener Bros.

North Carolina

Asheboro	Paige	Asheboro Motor Car Co.
Durham	Paige	Snow Motor Car Co.
Franklinton	Paige	Franklinton Garage Co.
Gastonia	Cole	Gastonia Garage Co.
Henderson	Haynes	J. S. Paythress & Son
Hickory	Paige	T. F. Bogle
Mebane	Paige	Mebane Motor Co.
Winston-Salem	Paige	Crawford Mill Supply Co.
Yanceyville	Paige	J. A. Massey

North Dakota

Bismarck	Haynes	K. Shenkenberg
Hillsboro	Haynes	Helgo Bros.
Oakes	Franklin	E. W. Weston

Ohio

Bucyrus	Haynes	Harry O. Paxton
Circleville	Reo	Clifton Bros.
Cleveland	Apperson	Eiseman Auto Co.
Cleveland	Haynes	W. H. Barger Co.
Columbus	Abbott-Detroit	W. W. Muzzy
Columbus	Chevrolet	Daniels Motor Car Co.
Columbus	Cole	Brasher Motor Car Co.
Columbus	Davis	Renner Auto Sales Co.
Columbus	Detroiter	Frank P. Corbett
Columbus	Dodge	Ohio Auto Sales Co.
Columbus	Ford	Renner Auto Sales Co.
Columbus	Haynes	P. H. Rogers Motor Car Co.
Columbus	Hupmobile	The Kaiser Motor Car Co.
Columbus	King	Auto Inn & Exchange
Columbus	Lexington-Howard	F. Mayer
Columbus	Marion	Frank P. Corbett
Columbus	National	O. G. Roberts & Co.
Columbus	Overland	O. G. Roberts & Co.
Columbus	Pilot	F. E. Jolly
Columbus	Velie	Spring Street Garage Co.
Columbus	Vulcan	Miller-Main Garage
Columbus	Waverley	Brasher Motor Car Co.
Columbus	White	Brasher Motor Car Co.
Coshocton	Hupmobile	Geo. J. Bock & Son
Dayton	Apperson	H. H. Barton
Greenville	Buick	Dunham Auto Co.
Greenville	Westcott	John Ludy
Lancaster	Reo	Clyde Chidester
Lima	Dodge	Baxter Bros.
Lima	Oldsmobile	W. E. Rudy
Logan	Studebaker	Studebaker Garage & Sales Co.
McConnelsville	Ford	Morgan County Garage
Newark	Overland	Fred S. Simpson
New Berlin	Apperson	W. E. Schumacher
Thornville	Overland	Thornville Garage
Toledo	Apperson	R & M Motor Car Co.
Toledo	Cadillac	Toledo-Cadillac Co.
Toledo	Chandler	Lichtie Auto Co.
Toledo	Oldsmobile	Bunnell Auto Sales Co.
Wooster	Apperson	H. H. Ziegler
Youngstown	Haynes	Electric Auto Service Co.

Oklahoma

Bigheart	Haynes	Bryant & Truitt
Dewey	Cole	L. E. Chanks
Tulsa	Herff-Brooks	J. H. Snider

Oregon

Portland	Apperson	Apperson Motor Car Co.

Pennsylvania

Beaumont	Dodge	Crew Bros.
Beaver	Haynes	Fort McIntosh Auto Co.
Bigerville	Herff-Brooks	E. H. Trostle
California	Haynes	Duff Garage
Clearfield	Cole	Wallace Garage
Duquesne	Oldsmobile	Old City Hall Garage Co.
Erie	Haynes	Wolverine Motor Co.
Fayette City	Haynes	J. P. Sloterbeck & Son
Franklin	Haynes	Geo. K. Moffett
Greensburg	Haynes	F. M. Seanor Motor Co.
Greenville	Haynes	Gillespie & Holden
Houston	Apperson	Isaac C. Patsch
Indiana	Haynes	C. H. Moore
Johnstown	Dodge	Lincoln Automobil Co.
Lamberton	Haynes	Hill Bros.
Philadelphia	Stevens-Duryea	F. W. Eveland
Pittsburg	Apperson	Pittsburg Apperson Co.
Punxsutawney	Haynes	Edelblute & Olson
Reading	Haynes	L. H. Fisher
Scranton	Apperson	C. C. Conrad
Tarentum	Haynes	Valley Motor Co.
Tunkhannock	Apperson	C. P. McKown
Tyrone	Apperson	Penna Auto Co.

Rhode Island

Providence	Apperson	Apperson Sales Co.
Providence	Dodge	Cadillac Auto. Co. of R. I.
Providence	King	Charles L. Bebeau
Providence	Pathfinder	Robert L. Knight

South Carolina

Charleston	Haynes	Palmetto Garage Co.
Columbia	Franklin	Gibbes Machinery Co.

South Dakota

Sioux Falls	Dodge	C. W. Thomson
Siseton	Cole	Staving Bros.

Tennessee

Bristol	Oldsmobile	L. C. King
Nashville	Hudson	Imperial Motor Car Co.

Texas

Amarillo	Dodge	W. E. Groendycke
Austin	Partin-Palmer	Deen's Garage
Brownsville	Haynes	Hinkley Auto Co.
Galveston	Cole	John Christensen & Co.
Galveston	Dodge	Galveston Motor Car Co.
Dallas	Paige-Detroit	Munger Automobile Co.

Utah

Ogden	Apperson	Becraft Auto Co.
Ogden	Buick	Wotherspoon & Jost
Salt Lake City	Apperson	Apperson Motor Car Co

Virginia

Norfolk	Apperson	Seay Bros.
North Tazewell	Herff-Brooks	W. A. Scott & Co.

Washington

Walla Walla	Dodge	Franklin Motor Car Co.

West Virginia

Parkersburg	Cole	O. D. Strader
Wheeling	Dodge	Engineering & Equipment Co.

Wisconsin

Beloit	Briscoe	James W. Nenhall Auto Co.
Bounduel	Briscoe	Adolf Ulmer
Coleman	Briscoe	Motor Car Co.
Dodgeville	Briscoe	E. C. Miller & Son
Grafton	Briscoe	Lansing Garage
Madison	Cole	R. A. Warner
Marinette	Cole	United Car Sales Co.
Milwaukee	Briscoe	Milwaukee Auto Sales Co.
Milwaukee	Haynes	W. H. Diener
Oshkosh	Briscoe	H. Hanley
Pardeeville	Briscoe	Royee Carpenter
Viroqua	Briscoe	Zityner & Fortney
Wausau	Cole	Wausau Garage

Accessories for the Automobilist

SPARTON Warning Signal—A hand-operated warning signal, Fig. 1, at the unusual price of $5 is now offered by the Sparks-Withington Co., Jackson, Mich. This represents a reduction of $3. A similar horn with a straight trumpet is also offered for $4.25. Both these horns are made so that they can be easily attached to the car, and they are well finished in black enamel and brass.

Multiple Cone Clutch—A multiple cone clutch whose special features are ease of engagement and long life is shown in Figs. 2 and 3. In the former illustration, which is a part section, the construction is shown very clearly. The three cones are all on the one four-splined shaft. When the clutch collar, indicated, is pushed to the left, which is out, the smaller cone is disengaged. When this is moved about 3-16 inch further its hub comes into contact with the hub of the middle cone and this cone is then forced out. In like manner the third cone is disengaged by the further movement of the clutch collar. These cones are engaged by springs of different strengths, the largest cone having the strongest spring.

When the clutch is to be engaged, the largest cone goes in first and the others follow in order. In this way a smooth and gradual clutching action is obtained. The facing is plain metal and the clutch runs in oil. The taper is 4 degrees and the overall length is 11⅞ inches. The clutch is designed for 35 horsepower at 1600 revolutions per minute. It is manufactured by the Automatic Gas Motor Co., Indianapolis, Ind.

Asch Hose Clamp—A simple and effective instrument for making hose clamps out of plain iron wire is offered by Asch & Co., 1779 Broadway, New York City. This device is shown in Fig. 4. The coupling is made by taking a piece of stout wire and bending it into a U shape and then slipping the free ends of the wire through the U as shown at the top, right. The tool is attached as shown, the ends of the wire being wound around the pins as indicated. The wire is then drawn tight by screwing up on the wing nut and when this is accomplished the tool is bent over to the right and the wire is cut off close to the hose leaving the hose clamp completed as shown at the left at the bottom. The price of this device is —

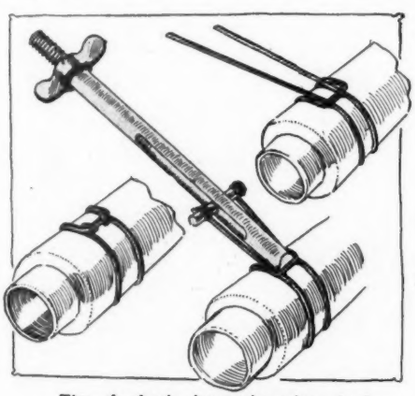


Fig. 4—Asch hose-clamping tool

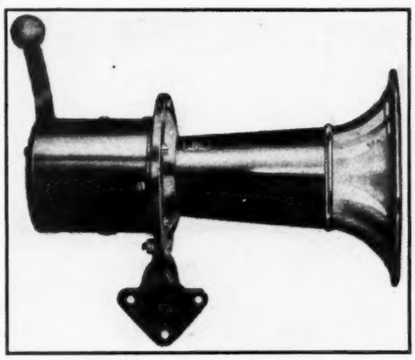


Fig. 1—Sparton hand-operated warning signal

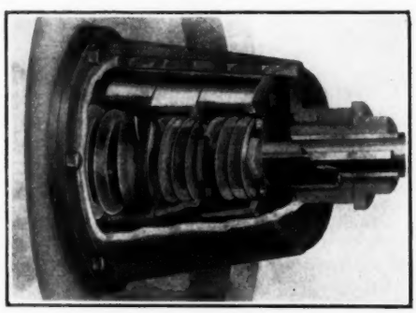


Fig. 2—Phanton view of Multiple cone clutch

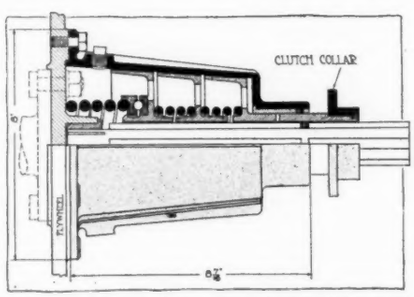


Fig. 3—Part section through Multiple cone clutch

Asch Suit Case Carrier—A handy device that should be appreciated by tourists is the suit case carrier shown in Fig. 5. It enables one or two suit cases or a small trunk to be solidly strapped to any running board. The carrier is adjustable so that it may be put in place instantly and changed from one car to the other as desired. The method of attachment is very simple. There is a screw clamp which can be tightened by hand as shown. The price per pair is $3. They are distributed by Asch & Co., 1779 Broadway, New York City.

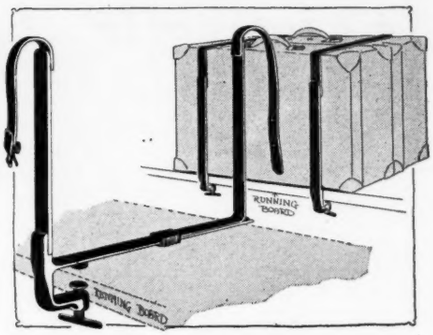


Fig. 5—Asch suitcase carrier

Holden Easybak Cushion—To fill in the little space at the base of the seat back, the Holden Mfg. Co., of St. Paul, Minn., is advancing the Easybak Cushion, which it claims makes the driver's seat like a morris chair. It allows the driver to rest while stretching out his feet to control the brake and clutch pedals and obviates the possibility of backache.

Carleton Electric Generator—To furnish current for automobile lighting, the Carleton Co., Boston, Mass., has placed on the market the Carleton electric generator, which, at the rate of 1,800 revolutions per minute, can provide sufficient power to supply lamps of 48 candlepower. This requires a current of 6 volts and 8 amperes. This is more than sufficient to supply any automobile. The generator sells for $15.

Grant-Lees Gearset—For cars weighing not over 1,600 pounds, the Grant-Lees Co., of Cleveland, Ohio, will have ready for delivery in October a new gearset. The case is aluminum, the gears of 3½ and the shafts of 1 per cent. nickel steel. This is made for cars carrying a motor of bore and stroke 3¼ by 5, and capable of developing 25 horsepower at 1,600 revolutions per minute.

Sewell Cushion Wheels—For motor trucks having solid tires, and for many that now carry pneumatic tires, the Sewell Cushion Wheel, made by the Sewell Cushion Wheel Co., Detroit, Mich., is advanced as economically effective in taking away the jars and jolts, while reducing tire costs. The principle of the wheel, Fig. 6, is an outer and inner rim, between which is a rubber cushion. At the side is a rubber flange, which is held in place by two steel bands. This serves

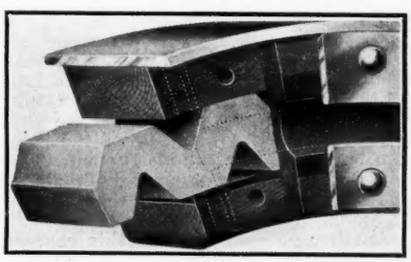


Fig. 6—Sewell cushion wheel for trucks

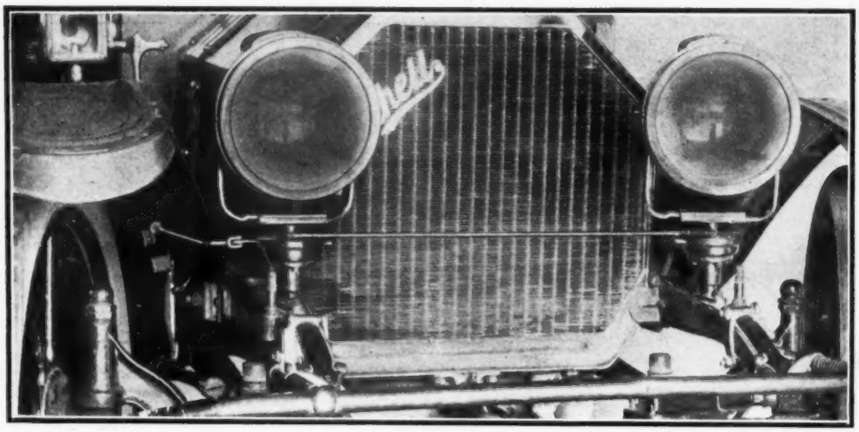


Fig. 7—Hughes turning headlights

to keep the rubber flange from bulging.

Hughes Turning Headlights—Fig. 7 shows a simple device invented by David Hughes, of Racine, Wis., for turning the headlights of the car automatically with the steering gear. Small movements do not make any difference in the straight, forward position of the lights, but further movement of the front wheels to the left or right points the headlights in the direction that the car is turning, so that the road is properly illuminated. The device can be installed on almost any make of car.

Davis Friction Drive—A friction transmission of unusual design has been brought out by the Davis Car Co., Seattle, Wash. It is illustrated, in Fig. 8, and it will be noted that the reduction is obtained by means of two pairs of cones. The drive cones have large faces over which the driven cones slide in and out to obtain the different reductions. It must be noted that, as the pair of driven cones move in to give high gear, the driving cones must move out. This is accomplished by means of the four arms pivoted at A. The pressure of the cones is adjusted by means of the two levers B. Since no provision is made for a differential, compensation is secured when rounding corners by the slippage of the pair of bevels that drive the inner wheels. The use of four cones instead of two also has the advantage that with a given permissible size of cones the wear is cut in half.

It is planned to assemble a light car weighing 1,200 pounds and equip it with this transmission.

Michelin Tire Poster—The Michelin Co. is sending out a poster which bears a humorous picture of the "Michelin Man" having removed from his anatomy a tire to aid a motorist who has evidently had a serious blow-out. The poster is 21 by 29 inches. It may be secured from the Michelin Co., Milltown, N. J., by sending 10 cents in stamps.

Weinhagen Hydrometer—H. Weinhagen, 160 Leonard street, New York, has brought out a hydrometer for use in battery work, this instrument having a bulb attachment at one end and a tube at the other. The mouth of the tube is immersed in the electrolyte, the bulb is squeezed and a quantity of the solution is carried into the instrument. This floats the small graduated bulb shown and in this way the gravity reading may be taken. It sells for $1.50.

Another accessory which this concern is marketing is a neat gradometer which

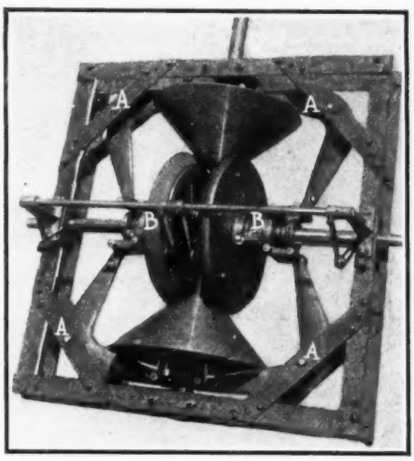


Fig. 8—Davis friction drive

is attached to some horizontal part in the front compartment, and which registers the steepness of a grade in per cent.

Pittsburgh Dirigible Searchlight—A searchlight, powerful enough to enable the occupant of a car to make out the numbers on houses, or to read small lettering on sign-posts, and which can be attached to the wind-shield in a moment, is being advanced by the Pittsburgh Electric Specialties Co., Pittsburgh, Pa. The searchlight can be attached to the battery or lighting system. It is operated on a universal and can be turned in any direction. With it one can look for trouble in the engine, at the same time having a more powerful light than is ordinarily obtained in a light made for this purpose.

Brazelton Headlights—An odd type of headlight has been introduced by G. T. Brazelton, Birmingham, Ala., which is built into the radiator and has shutters at the sides which permit the light to be thrown to the sides of the road. The shutters are operated from the driver's seat and the light coming through the shutters is thrown above the fenders owing to the high position of the lamps.

Hoosier Tandem Master Vibrator—The feature of the Hoosier master vibrator, shown in Fig. 9, is that two pairs of platinum contacts are employed instead of one, as ordinarily. These are connected so only one operates at a time, however. Should the operating pair stick the other pair will take up the work automatically.

The Hoosier Tandem, as it is called, is housed in a neat mahogany box with a substantial switch. It is manufactured by the Hoosier Oil Co., South Bend, Ind., and sells for $15.

Chaney Dimmer—A dash switch, Fig. 10, that graduates the intensity of the light from high to low and can be worked either with the hand or the foot, is made by the L. F. Chaney Co., Springfield, O. In city driving the light is kept low with small current consumption. In emergencies, where full power is needed, a touch on the handle brings back the full search light efficiency. On dark country roads, in isolated territories, the full search light glare is essential to the safety of the driver and the occupants of the car.

Cozy Cab Top for Fords—A stormproof top for 1913 and 1914 Ford runabouts has been brought out by the Fouts & Hunter Co., Terre Haute, Ind., under the name of the Cozy Cab top. This top is easily detachable and adjustable in a very short time. The Cozy Cab has a front window which is hinged at the top and swings up out of the way when not in use. The door curtains, made of rubber covered duck, roll up automatically around a metal spring roller concealed in a housing on each side of the front window. The front window takes the place of the ordinary windshield, but uses the holes employed for holding the latter. The side panels, one on each side of the seat, are held by the irons which secure the folding top. These panels fit around the edge of the seat. It sells for $50.

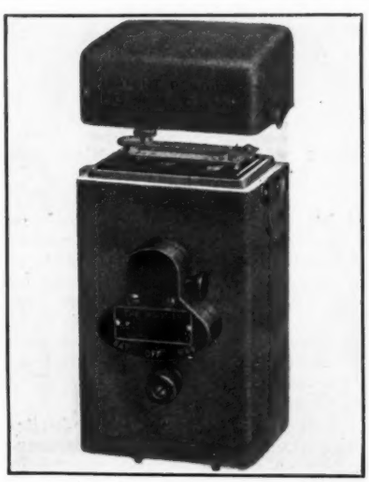


Fig. 9—Left—Hoosier Tandem Master Vibrator for Fords.

Fig. 10—Right—Chaney light dimmer. It may be operated by hand or foot